REPORT **2047-100**

GEOTECHNICAL INVESTIGATION REPORT
LEVEE REPAIR
Lower Penitencia Creek
Milpitas, California

September 2004

Prepared for:

Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3614

Geo/Resource Consultants, Inc.
GEOLOGISTS / ENGINEERS / ENVIRONMENTAL SCIENTISTS
211-10th STREET, SUITE 298, OAKLAND CALIFORNIA 94607

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September 16, 2004

GRC 2047-100

Ms. Stacy Lee
Santa Clara Valley Water District
5750 Alamaden Expressway
San Jose, CA 95118-3614

**RE: GEOTECHNICAL INVESTIGATION REPORT
LEVEE REPAIR
LOWER PENITENCIA CREEK
MILPITAS, CALIFORNIA**

Dear Ms. Lee:

Transmitted herewith is the report of our geotechnical investigation for the above referenced project. Based on our investigation, we believe that the repair project is feasible from a geotechnical engineering viewpoint, subject to the recommendations presented in the contents of this report.

We appreciate the opportunity to be of service to you for this project. If you have any questions regarding this report, please do not hesitate to contact us.

Respectfully submitted,
GEO/RESOURCE CONSULTANTS, INC.

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Alan D. Tryhorn, C.E.G.
Senior Vice President

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GEOTECHNICAL INVESTIGATION REPORT
LEVEE REPAIR
LOWER PENITENCIA CREEK
MILPITAS, CALIFORNIA

PREPARED FOR:
SANTA CLARA VALLEY WATER DISTRICT
5750 ALMADEN EXPRESSWAY
SAN JOSE, CALIFORNIA 95118-3614

PREPARED BY:
GEO/RESOURCE CONSULTANTS, INC.
211 10TH STREET, SUITE 298
OAKLAND, CALIFORNIA 94607

SEPTEMBER, 2004

JOB NUMBER 2047-100

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1.0 INTRODUCTION

Geo/Resource Consultants Inc.(GRC) has conducted a geotechnical investigation for a section of Lower Penitencia Creek levee (GIS Station 61+90 to 64+10) in the city of Milpitas, California, for the purpose of repair and restoration of two distinct localized soil slumps. The location of the site is presented in the Vicinity map, Figure 1.

2.0 PROJECT BACKGROUND

GRC understands that the current Lower Penitencia Creek channel improvements were constructed in the early 1980's. A review of the historic photos, and reports from SCVWD (District) staff indicate that localized slope instabilities have occurred at this location at least since 1998 or even earlier and they have gradually worsened over the years. The unstable slope areas were subsequently partially repaired in 1998. Reactivation of the slope instabilities occurred in the following winter storm season. Currently there are two locations where soil slumps have occurred on the inboard side of the eastern levee, at the outside bend of the creek. Figure 2 shows the location of the slumps. Further erosion of this part of the levee would possibly block channel flow and undermine the levee road at the top. GRC understands that it is the intent of the District to repair this part of the levee as a part of the Stream Maintenance Program.

3.0 SCOPE OF WORK

GRC's services on this project consisted of field exploration, laboratory testing, engineering analysis and repair recommendations for the slumped portions of the levee between GIS Stations 61+90 and 64+10, as outlined in the scope of services in our contract dated June 15, 2004. Included were the following scope elements:

- Review general soil data, historic photos and slope stability information.
- Drill 4 exploratory borings at the top and the toe of the levee.
- Laboratory testing on the soil samples recovered including moisture/density, Atterberg limits, triaxial strength, consolidation and permeability tests.
- Perform slope stability analysis for the proposed repaired sections.
- Provide construction considerations for the proposed repair.
- Summarize the results and recommendations in a written report.

4.0 FIELD EXPLORATION AND LABORATORY TESTING

4.1 Field Exploration

GRC explored the subsurface conditions of the proposed repair portion of the levee by drilling two pairs of borings. One pair of borings (B1, B2), was drilled towards Station 64+00 and the other pair (B3, B4) was located at Station 62+00. The locations of borings B1 through B4 are presented on Figure 2. Borings B1 and B3 were drilled from the top of the levee to a depth of 40 feet. Borings B2 and B4 were drilled towards the toe of the levee to a maximum depth of 20 feet. The top levee borings were drilled using rotary wash drilling equipment. The lower borings were drilled by a remote powered portable auger drill rig. The drilling was observed and recorded by our field representative who logged the soils and collected representative soil samples. The samples were obtained using a standard 140 pound hammer falling 30 inches, driving a split barrel sampler or in some cases by pushing steel Shelby tubes when soft soils were encountered. The logs of borings are presented on Figures 4 through 7. The soils are classified using the Unified Soil Classification System as shown in Figure 8.

4.2 Laboratory Tests

The soils were further examined in the laboratory. Cooper Testing Laboratories conducted triaxial compression strength with pore pressure measurement tests, consolidation test, and laboratory permeability measurements, and the remaining tests including sieve analysis, moisture/density determination and Atterberg Limits were tested by GRC. The results of the tests are indicated on the boring logs and presented in detail in Appendix A.

5.0 SITE CONDITIONS

5.1 Surface Conditions

The section of the Lower Penitencia Creek levee to be repaired consists of a section about 220 feet along the east levee. The top of the levee is an access road about 10 feet wide and is level and unpaved. The levee slopes down on both sides at about 1.5 horizontal to 1 vertical (1.5H:1V). Two distinct localized soil slumps on the inboard slope are obvious. The toe of the slope in the slump area has been pushed out into the creek. Sparse vegetation and marsh growth were seen at the toe area.

5.2 Subsurface Conditions

The subsurface conditions at the site consist of levee fill over alluvial deposits of sand and Bay Mud. The pair of borings along the northern section of the levee encountered about 7 to 12 feet of fill consisting of stiff sandy clay overlying sand, silty sand and gravels. The sands and gravels are loose to medium dense in nature and are saturated. Towards the southern end, our borings encountered stiff sandy clay fill in the upper 5 to

13 feet, overlying soft silty clay, which is typical of Bay Mud. The Bay Mud may contain scattered organic zones.

5.3 Groundwater

In general, groundwater was encountered in our borings at the time of drilling about 10 feet below the top of levee. We anticipate that groundwater will fluctuate with the seasons and possibly with tidal activity. The Lower Penitencia Creek drains to the Bay, and shares tidal connection with it.

6.0 DISCUSSION AND CONCLUSIONS

6.1 Proposed Levee Stability Evaluation

The levee stability evaluation generally follows the procedures for analyzing the stability of earth dams as delineated by the U.S. Army Corps of Engineers (Engineer Manual EM 1110-2-1902).

6.1.1 Interpreted Shear Strengths

Of the ten Isotropically Consolidated Undrained (ICU) triaxial tests conducted by Cooper Testing Laboratory, six were on Bay Mud specimens and two each were on the foundations sands and the existing levee fill. The results in terms of Mohr's circles for both total and effective stresses for each of these three material types are replotted on Figures 9, 10, and 11. The interpreted shear strength envelopes for total and effective stresses are shown on the figures. In the case of the foundation sands, there is wide variability with the undrained or total stress shear strengths varying from 1000 to 2000 psf in the two tests. For simplicity the undrained shear strength of 900 psf obtained from the six tests on Bay Mud has been used for the entire foundation.

6.1.2 Slope Stability Analysis

Slope stability analyses have been conducted for the following cases using the Program TSTAB (TAGA Engineering Software Services, 1985) for the idealized cross section shown in Figure 12. The analyses have been conducted only for the simple case of repair of the failures with fill similar to the existing levee fill and without the proposed keyway extending into the foundation materials. They are therefore conservative for the recommended repair which includes a keyway. The output files and a plot showing the search for the critical circular slip surface for each case are shown in Appendix B. Each case is identified by a three-letter label.

6.1.2.1 End-0f-Construction (EOC)

This case assumes that there is no further increase in the strength of the foundation materials and uses total stress or undrained strength parameters. Minimum factor of safety = 2.91.

6.1.2.2 Long Term Static (LTS)

This case uses drained or effective stress strengths. While long term static factors of safety are normally higher than the end-of-construction condition, in this case, because of the relatively low confining stresses, a lower factor of safety is obtained. Minimum factor of safety = 1.96.

6.1.2.3 Rapid Drawdown (RDD)

Because this case is not critical, a simple analysis using the fully saturated weight of the levee fill and undrained strengths from ICU triaxial tests has been conducted. This is equivalent to the Corps of Engineers method described by Duncan, Wright and Wong (Seed Memorial Symposium, 1990). Duncan et al. state, and illustrate by three examples, that this method is always more conservative than the more elaborate three-stage method which they also describe. Minimum factor of safety = 2.35.

6.1.2.4 Pseudo-Static Seismic (PSS)

This analysis assumes no water against the levee, undrained strengths from ICU triaxial tests and a seismic coefficient of 0.15. Minimum factor of safety = 2.12. The possibility of the development of excess pore pressures under seismic loadings in the sandy part of the foundation has been evaluated qualitatively. While loose, saturated sand deposits in recent stream channels are generally susceptible to the development of excess pore pressures and liquefaction, we judge that the risk of liquefaction of the sandy materials left in place under the existing levee is low and therefore the undrained strength of the foundations materials has not been further reduced from the value of 900 psf used in the static analyses.

6.1.2.5 High Water (HWT)

The flood stage analysis assumes that water rises to within 3 feet of the crest of the levee and uses undrained shear strengths. The elevation of the adjacent school yard has conservatively been assumed to be 15 feet below the crest of the levee. Minimum factor of safety = 2.91.

6.1.2.6 Steady State Seepage (SSS)

This analysis also assumes that water rises to within 3 feet of the crest of the levee and uses drained or effective stress strengths as opposed to undrained strengths. Minimum factor of safety = 1.96.

6.2 Seismic Related Hazards

The Lower Penitencia Creek site is on a nearly level alluvial plain, and bedrock beneath the site is very deep, on the order of several hundred feet.

The San Francisco Bay region is an area of high seismic activity. The San Andreas fault system, forming the bounding surface between the obliquely convergent North America and Pacific plates, trends northwest through the region in a 50-mile-wide band. The San Andreas system has produced strong earthquakes in the past and may be expected to do so in the future.

The site is not crossed by an active fault, as indicated on the current Alquist-Priolo Earthquake Fault Map published by the California Division of Mines and Geology (CDMG, 1982, 1997, 1998 Supplement).

Among the prominent fault zones within the San Andreas fault system are the Hayward, Calaveras, San Andreas, Monte Vista-Shannon, Greenville, Sargent, the Great Valley fault segments 6 and 7, and the Zayante-Vergeles faults. A list of these major, active faults within the region, the associated maximum moment magnitude earthquake, and distance to the site follows in Table 1.

TABLE 1

Active Faults and Potential Earthquake Sources within 25 Miles of Site

Fault	Maximum Earthquake Magnitude (Mw)(1)	Estimated Peak Horizontal Ground Acceleration (g) (2)	Distance From Site In miles (km)
Hayward	7.1	0.44	4.7 (7.5)
Calaveras	6.8	0.37	6 (10)
Monte Vista-Shannon	6.8	0.21	14.5 (23)
San Andreas (1906)	7.9	0.33	16 (26)
Greenville	6.9	0.14	20 (33)
Sargent	6.8	0.12	21 (34)
Great Valley Segments 6/7	6.7	0.10	24 (38)
Zayante-Vergeles	6.8	0.10	25 (40)

(1) California Division of Mines and Geology, 1998
(2) Campbell, 1997

6.3 Levee Settlement

The existing subject levee section does not appear to have an excessive settlement problem. Based on the consolidation test data and the estimated weight of the overburden fill, we believe that the Bay Mud beneath the levee has been overconsolidated. We estimate that long term settlement of the proposed levee section will be relatively small, on the order of less than 5 inches.

7.0 RECOMMENDATIONS

7.1 Levee Construction

7.1.1 General

The repair will extend between GIS Station 61+90 and 64+10, a total of about 220 feet. The repair will require excavation of existing levee embankment and portions of the levee foundation soils, and placement of new levee fill. The construction will require cofferdam construction both upstream and downstream of the repair area. Channel flow will have to be diverted from the construction area by some combination of pumping or piping.

7.1.2 Levee Fill and Excavation

The levee will be restored to match the as-constructed slope of no steeper than 1.5H to 1V slope. Excavation will be along the embankment to remove all slumped and disturbed soils, and unsuitable foundation soils. Soils that contain vegetation and organic content will be removed or wasted. Existing suitable embankment soils can be stockpiled and reused. A 5-foot minimum depth and 5-foot wide buttress (in the foundation soils) will have to be excavated along the toe of the levee. The buttress should be filled with a minimum 3-foot layer of rock fragments consisting of angular stone and/or boulders with size ranging from 3 inches to 12 inches approximately. The rock layer will provide construction vehicle support and also serve as part of the buttress fill. New fill can either be acceptable on-site soils or import fill that meets the project specifications. Fill will be placed to form the new levee embankment and toe buttress. Levee bank should be overbuilt and then cut back to proper slope and dimensions. The details of the new levee construction are presented on Figure 13.

7.1.3 Erosion Protection

The new embankment surface should be protected from erosion by placing jute net or any alternative geo-fabric (with no plastic) and hydro seeding to encourage vegetation along the entire new embankment. Surface drainage from the top roadway should be controlled to avoid concentrated flow down the embankment slope.

7.2 Earthwork Requirement

7.2.1 Clearing and Subgrade Preparation

All brush, vegetation and debris should be removed from site. The area of excavation should be kept relatively dry to allow stable cut and fill placement. Fill should only be placed on a firm and stable subgrade.

7.2.2 Levee Fill Requirement

The on-site levee fill free of vegetation can be used as new fill. New import fill, if needed, should meet the following requirements:

Maximum size - not more than 6 inches in greatest dimension
Soil Type - classified as clayey soil (CL) or as approved by a District Geotechnical Engineer
Plasticity – P.I. less than 20 or as approved by a District Geotechnical Engineer
Organic Content - Not more than 3 % by weight

7.2.3 Compaction Requirement

All structural levee fill should be placed in thin layers not more than 6 inches in loose thickness, properly moisture conditioned and compacted to 95% compaction (ASTM D 1557). Where fills are to be placed to meet existing levee fill, the fill should be keyed into existing levee soil by providing benches of minimum 2 feet deep and 4 feet wide.

7.2.4 Temporary Slope and Excavations

A temporary cut slope of not more than 1H:1V slope can be considered in dry excavations. Where cut in wet soils or under water, they should be cut at a flatter slope or be temporarily shored. All excavations should meet OSHA excavation and trench safety standards.

7.3 Construction Observation and Testing

The earthwork and the foundation phases of the levee construction should be observed and tested to 1) establish that subsurface conditions are compatible with those used in the analysis and design; 2) observe compliance with design concepts, specifications and recommendations; 3) allow design changes in the event that the subsurface conditions differ from anticipated. The recommendations in this report are based on a limited number of borings. The nature and extent of variation across the site may not become evident until construction. If variations are then exposed, it will be necessary to reevaluate our recommendations.

7.4 Levee Maintenance and Monitoring

We recommend that the levee be monitored to check on embankment condition, crest settlement if it occurs and surface runoff condition. Periodic inspection of levee should be performed to evaluate the overall structural integrity of the levee embankment.

8.0 LIMITATIONS

The above services consisted of professional opinions and conclusions by a consulting engineer. The only warranty or guarantee made by the consultant in connection with services performed for this project is that such services are performed with the care and skill ordinarily exercised by members of the profession practicing under similar conditions at the same time and in the same or similar locality. No other warranty, expressed or implied, is made or intended by rendition of consulting services or by furnishing written reports of the findings.

This report is based upon the services we provided in conducting the study for the specific purposes of a Geotechnical Investigation, as described herein. The Project Design Team is entitled to rely on this report.

Note, too, that the report is subject to certain limitations that may or may not be noted in the report itself. In addition, recognize that the passage of time affects the information provided in the report: our opinions relating to site conditions are based upon information that existed at the time our conclusions were formulated. As we are sure you can appreciate, site conditions can change rapidly, such as seasonally, or in some cases, overnight.

Please understand that the services provided for in this project were limited to the specific requirements of Santa Clara Valley Water District; the limited scope of service allows our firm to form no more than an opinion of the actual conditions at the site. This letter confers upon no third party other than the Project Design Team the right to rely upon the information contained in the report or this letter. No other party is entitled to rely on the report unless our express written consent is first obtained. Please contact us if you have any questions or concerns regarding the information contained in the report or these limitations.

9.0 REFERENCES

California Division of Mines and Geology (CDMG), 1982, Alquist-Priolo Earthquake Fault Hazard Zone, Milpitas Quadrangle.

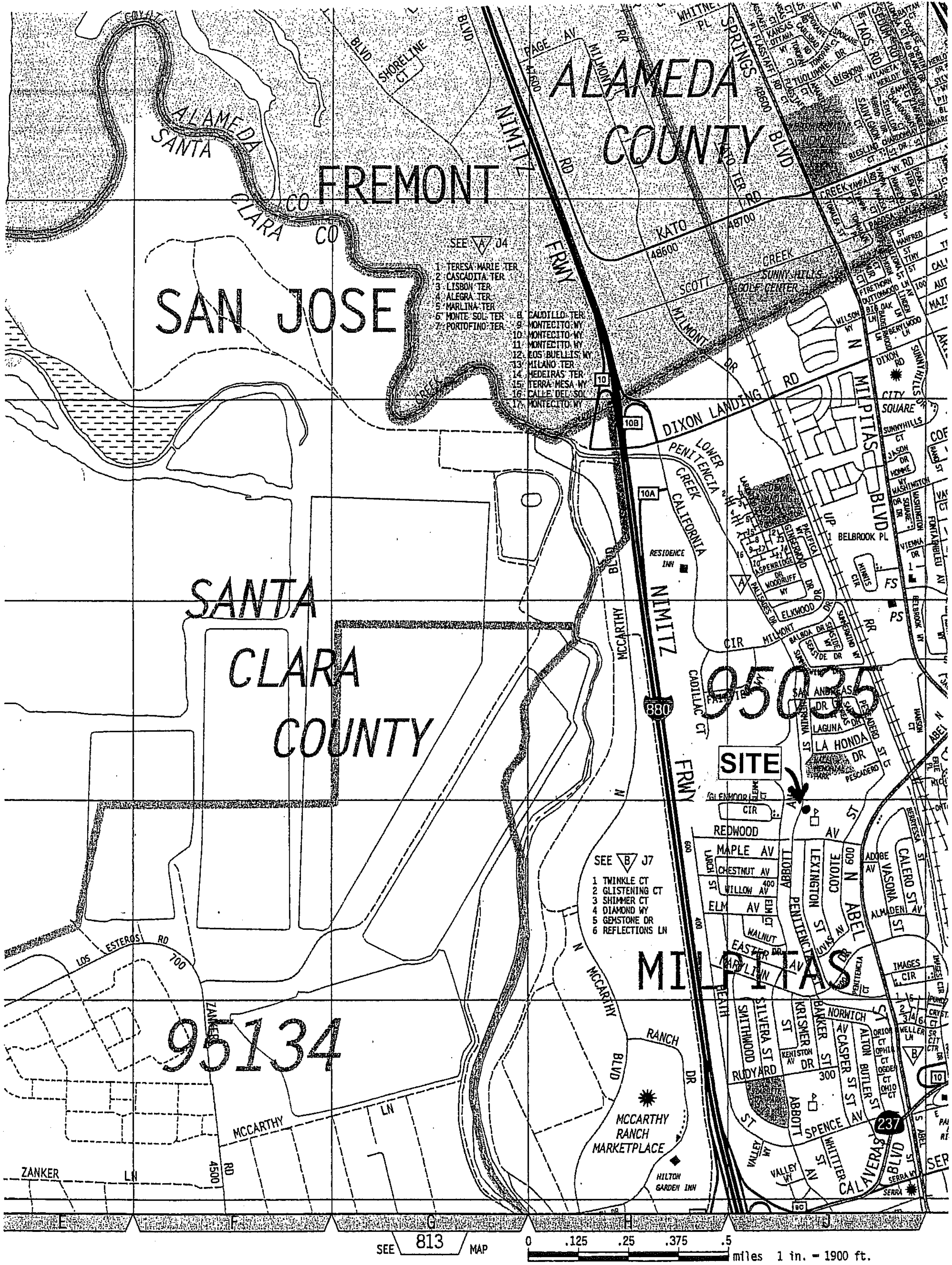
California Division of Mines and Geology (CDMG), 1997 (with 1998 Supplement), Fault-Rupture Hazard Zones in California: Special Publication 42, 32p.

California Division of Mines and Geology (CDMG), February, 1998, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada, to be used with the 1997 Uniform Building Code.

Campbell, K.W., 1997, Empirical Near-Source Attenuation Relationships for Horizontal and Vertical Components of Peak Ground Acceleration, Peak Ground Velocity, and Pseudo-Absolute Acceleration Response Spectra", Seismological Research Letters, Vol. 68, No. 1, pp. 154-179; with ERRATUM, Vol. 71, No. 3, pp. 352-354, and ERRATUM, Vol. 72, No. 4, p.474.

FIGURES

FIGURE 1
VICINITY MAP



Source: Thomas Bros. Maps, 2002

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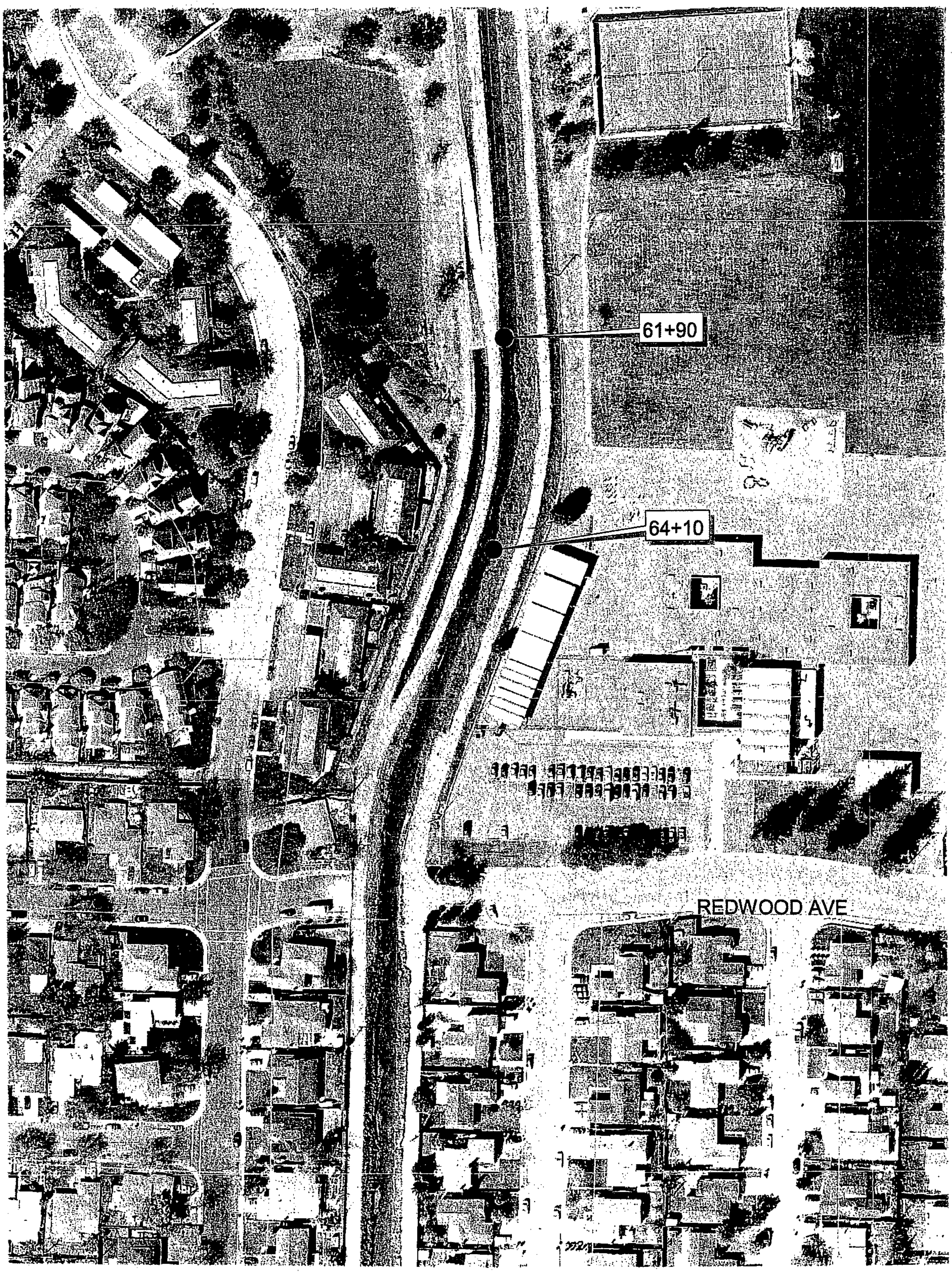
Site Vicinity Map
Slope Repair
Lower Penitencia Creek
Milpitas, California

FIGURE
1

FIGURE 2
SLOPE REPAIR LOCATION MAP



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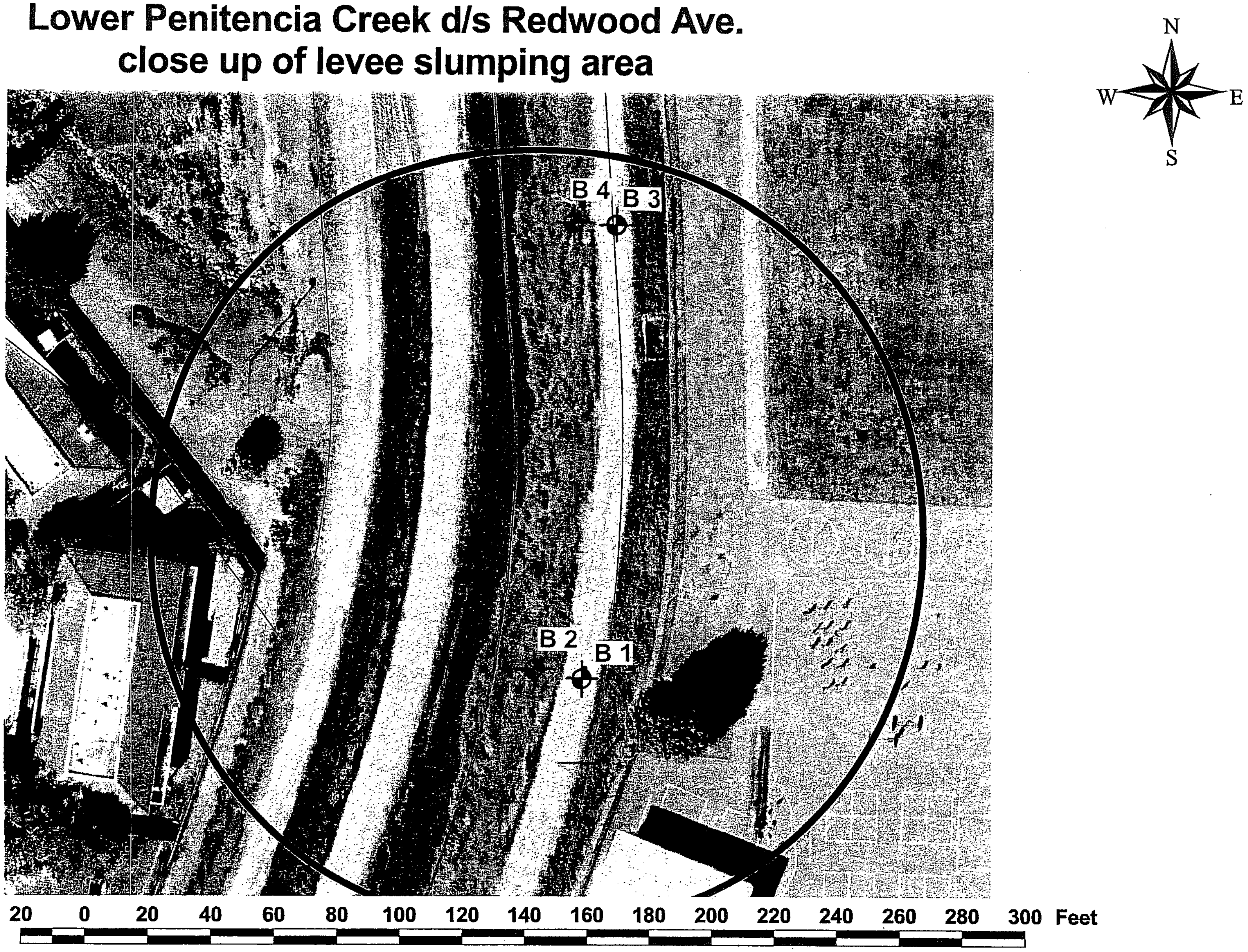
Slope Failure Location Map
Slope Repair
Lower Penitencia Creek
Milpitas, California

FIGURE
2

FIGURE 3
BORING LOCATION PLAN

Lower Penitencia Creek d/s Redwood Ave.
close up of levee slumping area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B 3
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B 1
20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 Feet

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Boring Location Plan
Slope Repair
Lower Penitencia Creek
Milpitas, California

Figure
3

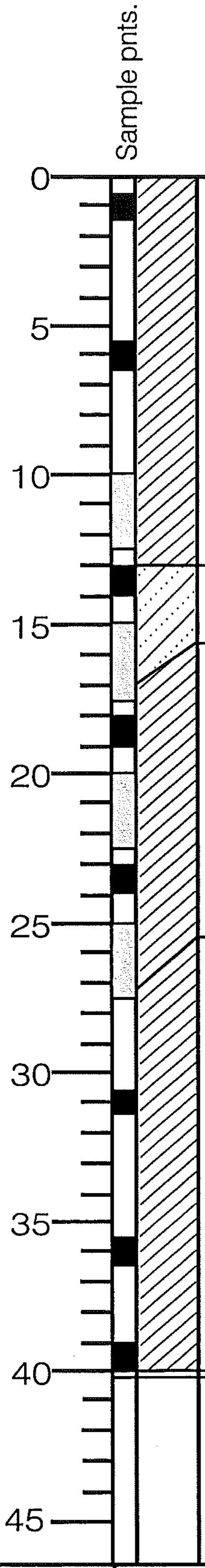
FIGURES 4-7
LOGS OF TEST BORINGS

LOG OF BORING B-1

Equipment: Rotary Wash

Elevation: N. A. Date: 07-13-04

Laboratory Analysis	Blows/ft.	Moisture Content (%)	Dry Density (pcf)
	37	7.5	98
	31	18.8	94
TXCU 1850 (1100) Permeability Test	PUSH	20.8	97
	20		
TXCU 850 (1500) LL=41, PI=18.5	PUSH	48.6	72
	10		
TXCU 1000 (2000) Consolidation Test	PUSH	42.7	77
	10		
	PUSH		
	24		
	17		
	36		



Light Brown Sandy CLAY (CL) stiff, moist, (LEVEE FILL)

Becoming saturated

∇

Yellow Brown Clayey SAND (SC) medium dense, saturated

Brown-Gray Sandy CLAY (CL) soft, saturated

Brown-Gray Sandy CLAY (CL) stiff, wet

Bottom of boring at 40.0 feet

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LOG OF BORING B-1

SLOPE REPAIR
LOWER PENITENCIA CREEK
MILPITAS, CALIFORNIA

Figure

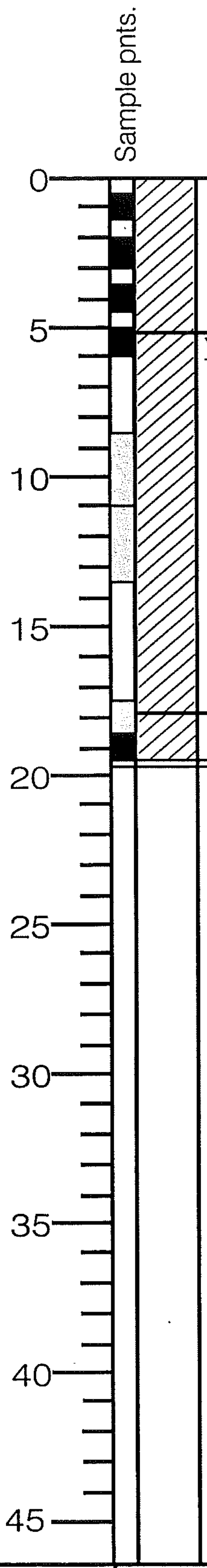
4

LOG OF BORING B-2

Equipment: Portable Auger

Elevation: N. A. Date: 07-13-04

Laboratory Analysis	Blows/ft.	Moisture Content (%)	Dry Density (pcf)
	37		
	59		
	30	12.1	117
	17		
TXCU 825 (1100) LL=61, PI=40	PUSH	48	73
TXCU 900 (2000) LL=33, PI=16.6	PUSH	45.7	74
	PUSH 24		



Light Brown Sandy CLAY (CL) stiff, moist, (LEVEE FILL)

▽ Gray-Brown Silty CLAY (CL) soft, saturated

Grading Sandy

Light Brown Sandy CLAY (CL) stiff, wet

Bottom of boring at 19.5 feet

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LOG OF BORING B-2

SLOPE REPAIR
LOWER PENITENCIA CREEK
MILPITAS, CALIFORNIA

Figure

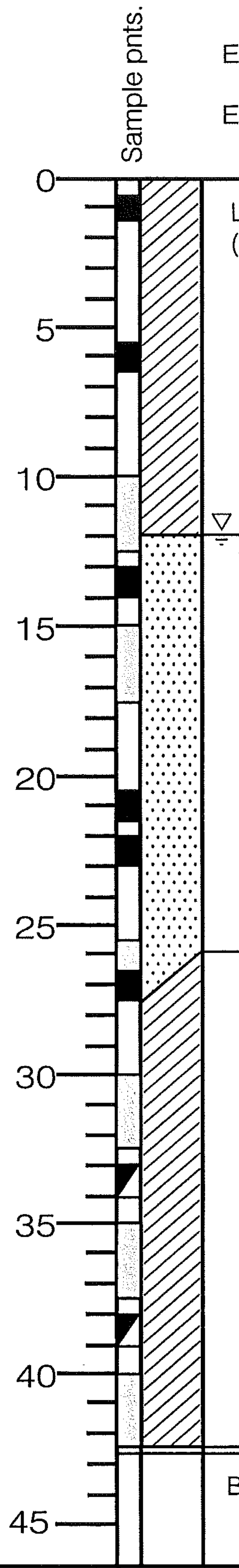
5

LOG OF BORING B-3

Equipment: Rotary Wash

Elevation: N. A. Date: 07-14-04

Laboratory Analysis	Blows/ft.	Moisture Content (%)	Dry Density (pcf)
	31		
TXCU 1200 (1100)	35	19.8	104
LL=43, PI=29			
TXCU 1600 (2100)		26.0	97
	PUSH		
Sieve Anaysis	9		
(NO RECOVERY)	PUSH		
	12		
	51	9.8	124
(NO RECOVERY)	PUSH		
	19		
	PUSH		
	16		
	PUSH		
	16		
	PUSH		



Light Brown Sandy CLAY (CL) stiff, moist (LEVEE FILL)

Yellow-Brown fine SAND (SP) loose, saturated

Loose gravel

Yellow-Gray CLAY (CL) very stiff, saturated

Bottom of boring at 42.5 feet

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211 TENTH STREET SUITE 298 OAKLAND, CA 94607

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LOG OF BORING B-3

SLOPE REPAIR
LOWER PENITENCIA CREEK
MILPITAS, CALIFORNIA

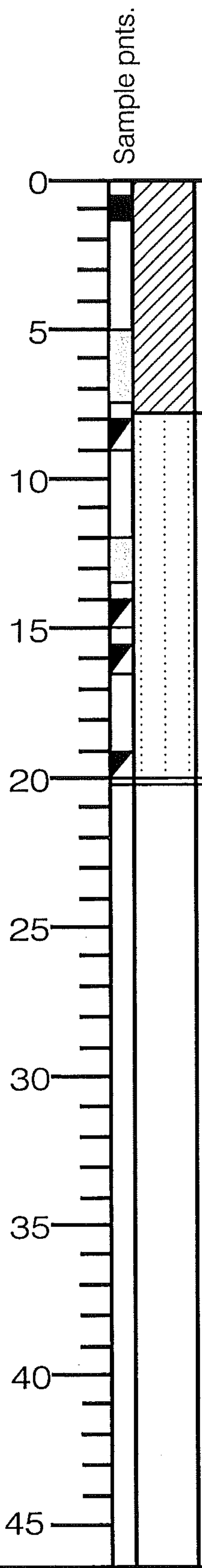
Figure 6

LOG OF BORING B-4

Equipment: Portable Auger

Elevation: N.A. Date: 07-14-04

Laboratory Analysis	Blows/ft.	Moisture Content (%)	Dry Density (pcf)
	24	10.4	110
LL=64, PI=39	PUSH		
	4		
TXCU 1050 (1100)	PUSH	30.1	92
	15		
	15		
	6		



Light Brown Sandy CLAY (CH) stiff, dry
▽ (LEVEE FILL)

Gray Silty SAND (SM) loose, saturated

Encountered Gravel

Bottom of boring at 20.0 feet

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GEOLOGISTS / ENGINEERS / ENVIRONMENTAL SCIENTISTS
211 TENTH STREET SUITE 298 OAKLAND, CA 94607

Job Number: 2047-100

Approved by: ADT Date: 07-30-04

LOG OF BORING B-4

SLOPE REPAIR
LOWER PENITENCIA CREEK
MILPITAS, CALIFORNIA

Figure

7

FIGURE 8
SOIL CLASSIFICATION CHART

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS					SOIL DESCRIPTIONS
COARSE GRAINED SOILS over 50% coarser than No. 200 sieve	GRAVELS over half of coarse fraction larger than No. 4 sieve	clean gravels with <5% fines	GW	▩	Well Graded Gravels, Gravel - Sand Mixtures
			GP	⁙	Poorly Graded Gravels, Gravel - Sand Mixtures
		gravels with >12% fines	GM	▥	Silty Gravels, Poorly Graded Gravel - Sand - Silt Mixtures
			GC	▨	Clayey Gravels, Poorly Graded Gravel - Sand - Clay Mixtures
	SANDS over half of coarse fraction finer than No. 4 sieve	clean sands with <5% fines	SW	▓	Well Graded Sands, Gravelly Sands
			SP	░	Poorly Graded Sands, Gravelly Sands
		sands with >12% fines	SM	▥	Silty Sands, Poorly Graded Sands - Silt Mixtures
			SC	▨	Clayey Sands, Poorly Graded Sands - Clay Mixtures
FINE GRAINED SOILS over 50% is finer than No. 200 sieve	SILTS AND CLAYS liquid limit <50		ML	▥	Silts, Very Fine Sands, Silty or Clayey Fine Sands
			CL	▨	Low Plasticity Clays, Sandy or Silty Clays
			OL	▥	Low Plasticity Organic Silts and Clays
	SILTS AND CLAYS liquid limit >50		MH	▥	Micaceous and Diatomaceous Silts, Volcanic Ash, Elastic Silts
			CH	▨	High Plasticity Clays - Fat Clays
			OH	▨	High Plasticity Organic Silts and Clays
	HIGHLY ORGANIC SOILS		PT	⁙	Peat and Other Fibrous Organic Soils

KEY TO SAMPLES

◪ Standard Penetrometer Test 2" outside diameter

■ Modified California 3" outside diameter

▒ Hydraulically pushed Shelby tube

□ Indicates depth of sampling with no recovery

KEY TO TEST DATA

Shear Strength, psf
Confining Pressure or Normal Load, psf

TxUU	2000(1000)	Unconsolidated Undrained Triaxial
TxCU	2000(1000)	Consolidated Undrained Triaxial
TxCD	2000(1000)	Consolidated Drained Triaxial
DS	2000(1000)	Direct Shear
qu/2	1000	Shear Strength obtained from Unconfined Compression Test

LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
SA = Sieve Analysis
C = Consolidation Test

-200 = material passing No. 200 sieve
▽ = first encountered groundwater
▼ = stabilized groundwater

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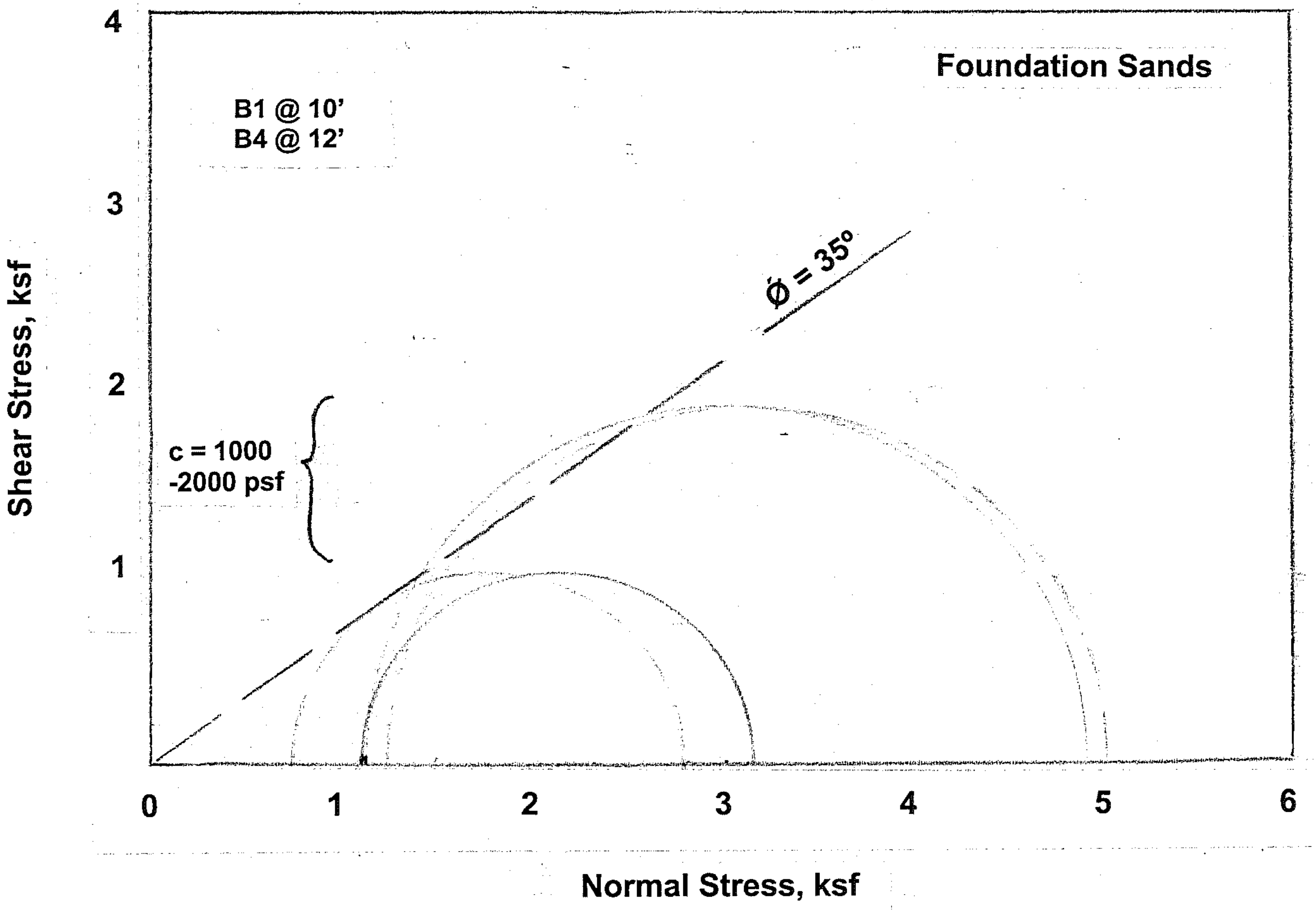
GEOLOGISTS / ENGINEERS / ENVIRONMENTAL SCIENTISTS
211 10th Street, Suite 298, Oakland, California 94607

Job Number: 2047-100 Approved by: ADT Date: 09-09-04

SOIL CLASSIFICATION CHART
AND
KEY TO TEST DATA

Figure
8

FIGURES 9-11
TOTAL AND EFFECTIVE SHEAR STRENGTHS



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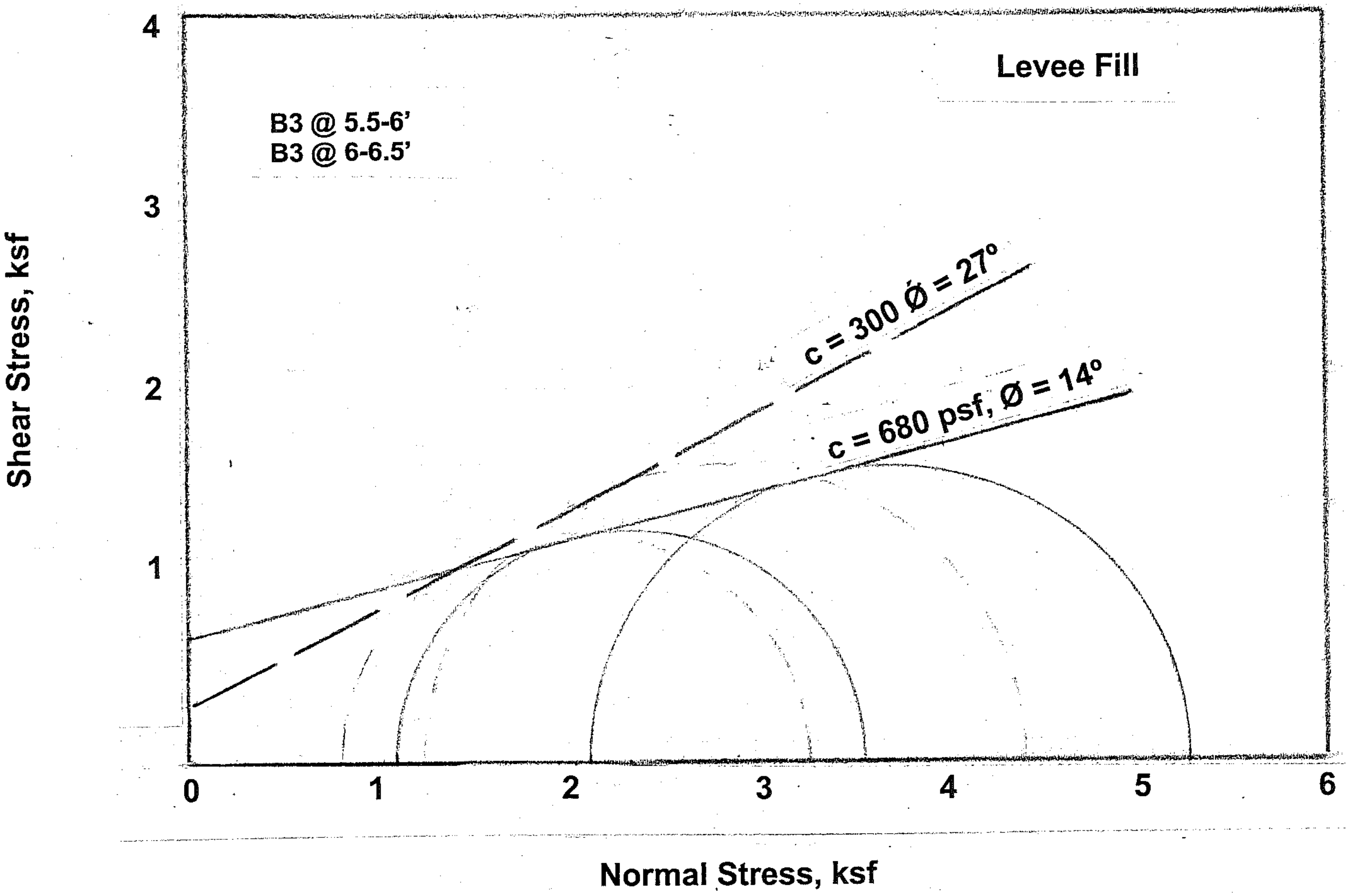
GEOLOGISTS / ENGINEERS / ENVIRONMENTAL SCIENTISTS

Job Number: 2047-100 Approved by: HDT Date: 09/09/04

Foundation Sands
Lower Penitencia Creek
Milpitas, California

Figure
9



GEO/RESOURCE CONSULTANTS, INC.
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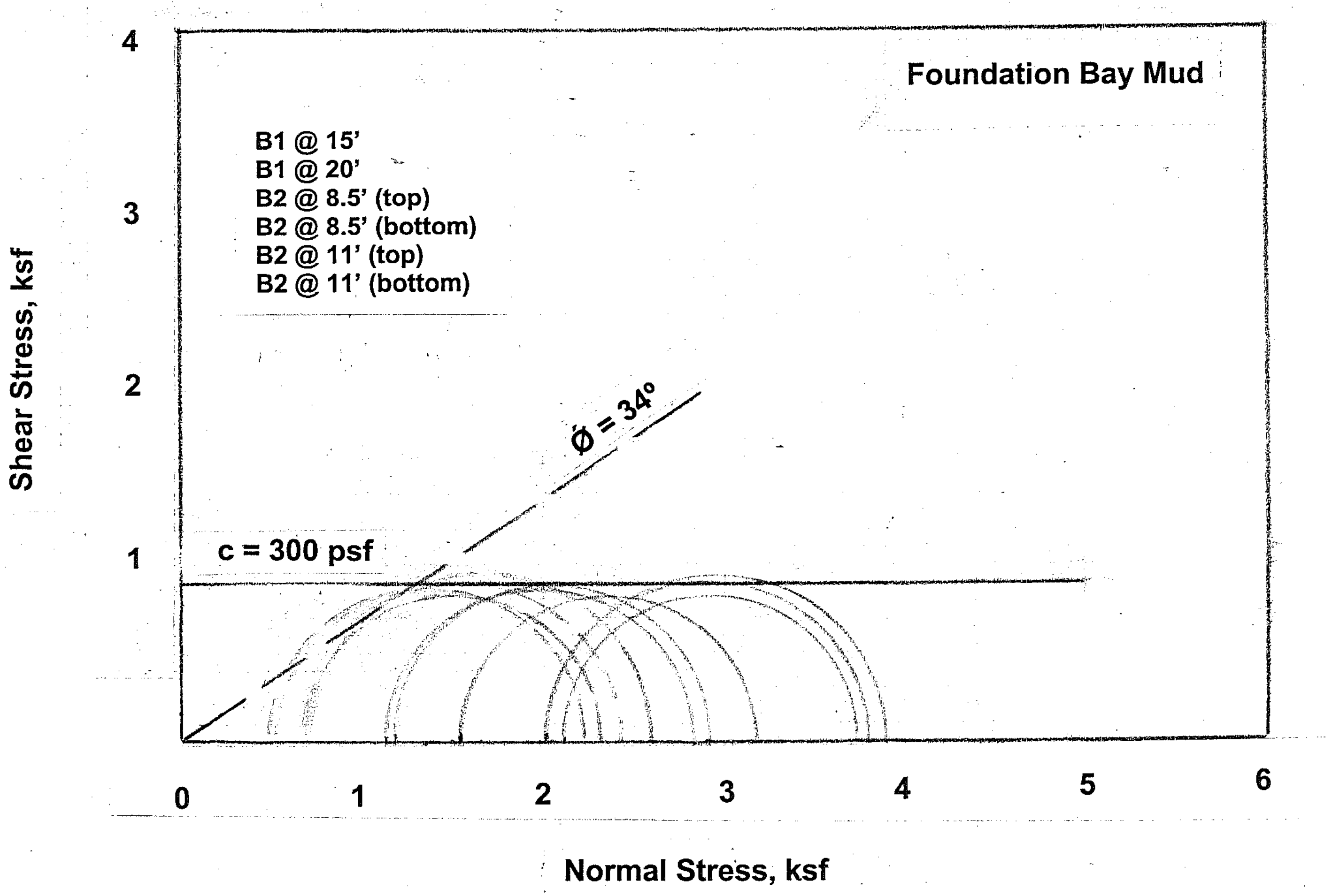
Job Number: 2047-100 Approved by: AOT Date: 09/09/04

Levee Fill
Lower Penitencia Creek
Milpitas, California

Figure
10



GEO/RESOURCE CONSULTANTS, INC.
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Job Number: 2047-100 Approved by: Date: 09/09/04

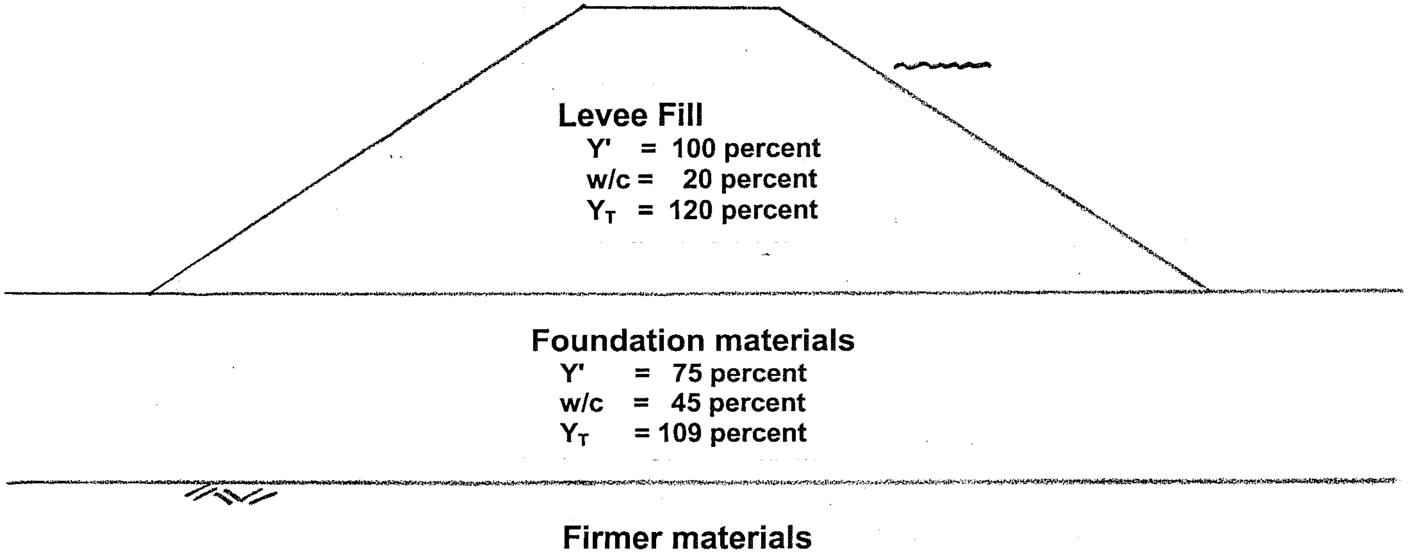
Foundation Bay Mud
Lower Penitencia Creek
Milpitas, California

Figure

11

FIGURE 12
IDEALIZED CROSS SECTION

1 inch = 10 feet



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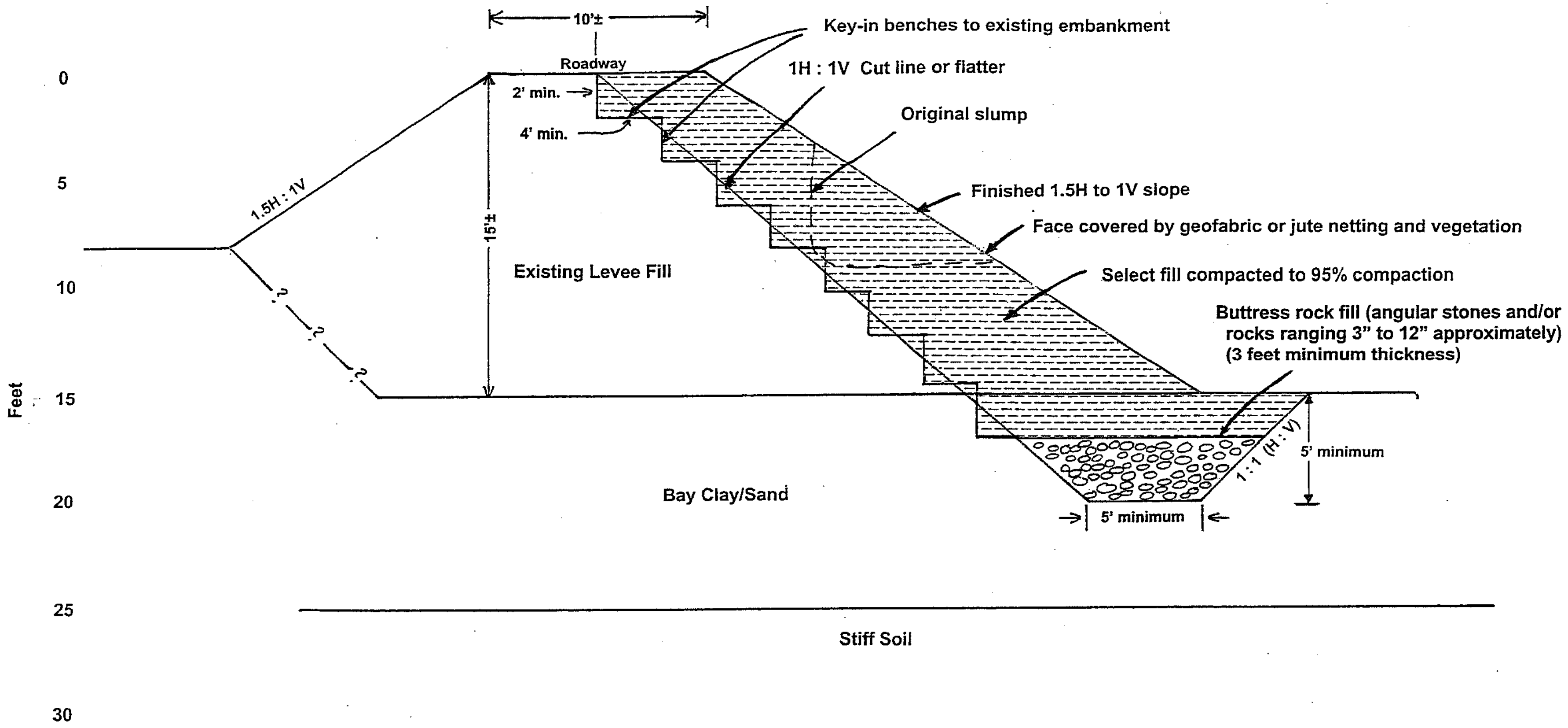
Job Number: 2047-100
Approved by:
Date: 09/09/04

Idealized Cross Section For Slope Stability Analysis Lower Penitencia Creek Milpitas, California

Figure

12

FIGURE 13
NEW LEVEE CONSTRUCTION


10'±
Key-in benches to existing embankment
Roadway
1H : 1V Cut line or flatter
2' min.
4' min.
Original slump
Finished 1.5H to 1V slope
Face covered by geofabric or jute netting and vegetation
Select fill compacted to 95% compaction
Buttress rock fill (angular stones and/or rocks ranging 3" to 12" approximately) (3 feet minimum thickness)
1.5H : 1V
15'±
Existing Levee Fill
?
?
?
Bay Clay/Sand
1 : 1 (H : V)
5' minimum
5' minimum
Stiff Soil
Feet
0
5
10
15
20
25
30

GEO/RESOURCE CONSULTANTS, INC.

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Job Number: 2047-100 Approved by: ADT Date: 09/09/04

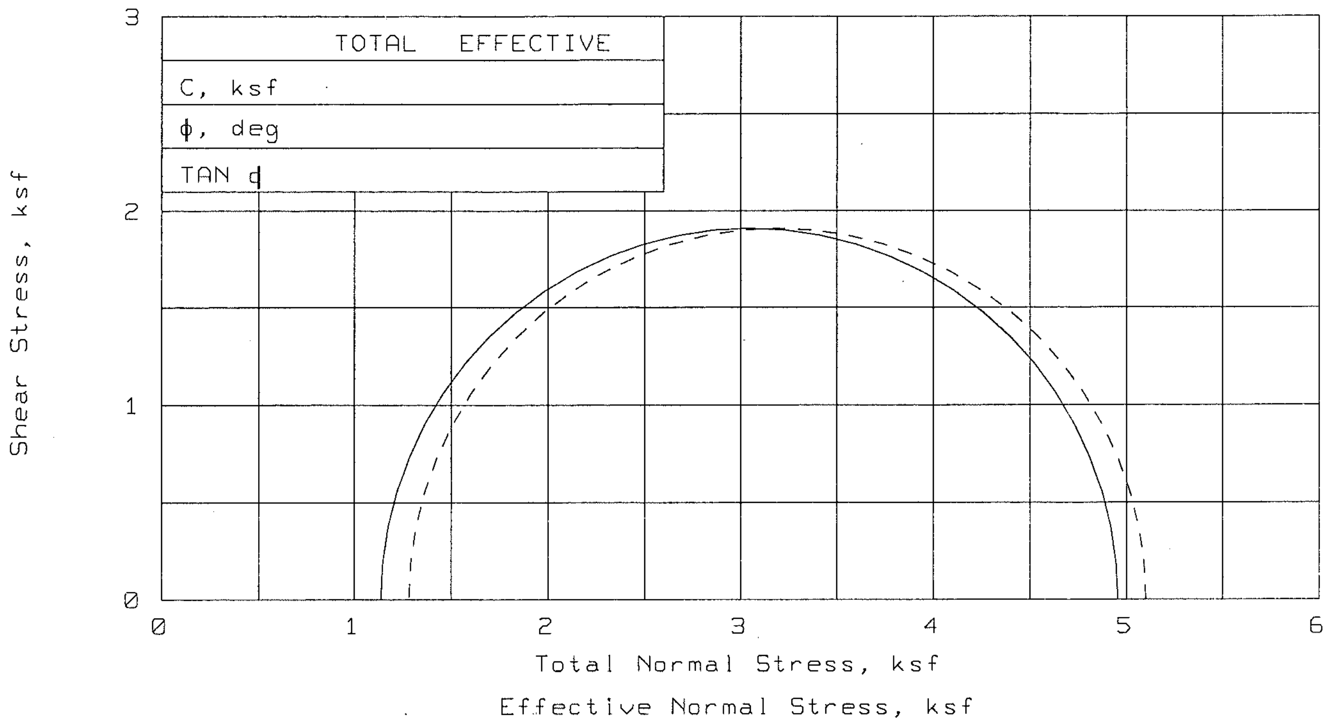
Levee Repair Scheme
Lower Penitencia Creek
Milpitas, California

Figure

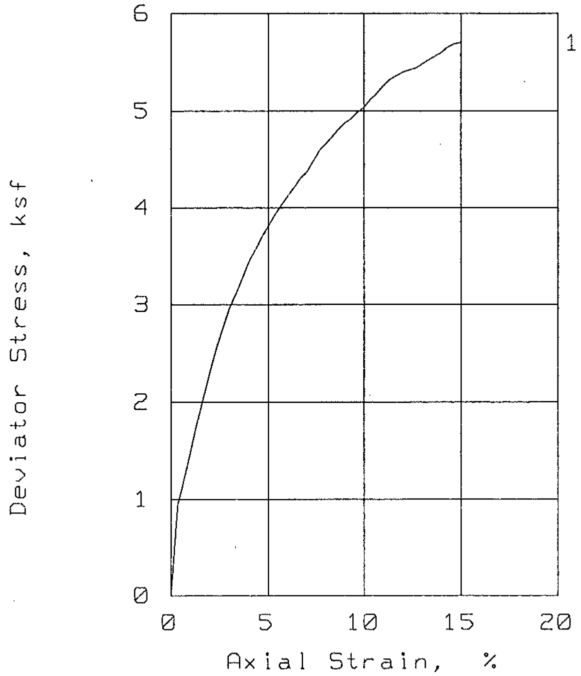
13

APPENDICES

APPENDIX A
LABORATORY TEST DATA



	TOTAL	EFFECTIVE
C, ksf		
φ, deg		
TAN φ		



SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	20.8
	DRY DENSITY, pcf	97.3
	SATURATION, %	76.8
	VOID RATIO	0.732
	DIAMETER, in	2.870
	HEIGHT, in	6.000
AT TEST	WATER CONTENT, %	25.3
	DRY DENSITY, pcf	100.1
	SATURATION, %	100.0
	VOID RATIO	0.684
	DIAMETER, in	2.837
	HEIGHT, in	5.970
Strain rate, %/min		0.03
EFF CELL PRESSURE, ksf		1.138
DEVIATOR STRESS, ksf		3.818
EXCESS PORE PR., ksf		-0.144
STRAIN, %		5.0
ULT. STRESS, ksf		
EXCESS PORE PR., ksf		
STRAIN, %		
$\bar{\sigma}_1$ FAILURE, ksf		5.100
$\bar{\sigma}_3$ FAILURE, ksf		1.282

TYPE OF TEST:
CU with Pore Pressures

SAMPLE TYPE: Undisturbed

DESCRIPTION: Brown Silty SAND

ASSUMED SPECIFIC GRAVITY= 2.7

REMARKS: Strengths picked at
5% strain.

Fig. No.: A1a

CLIENT: GRC

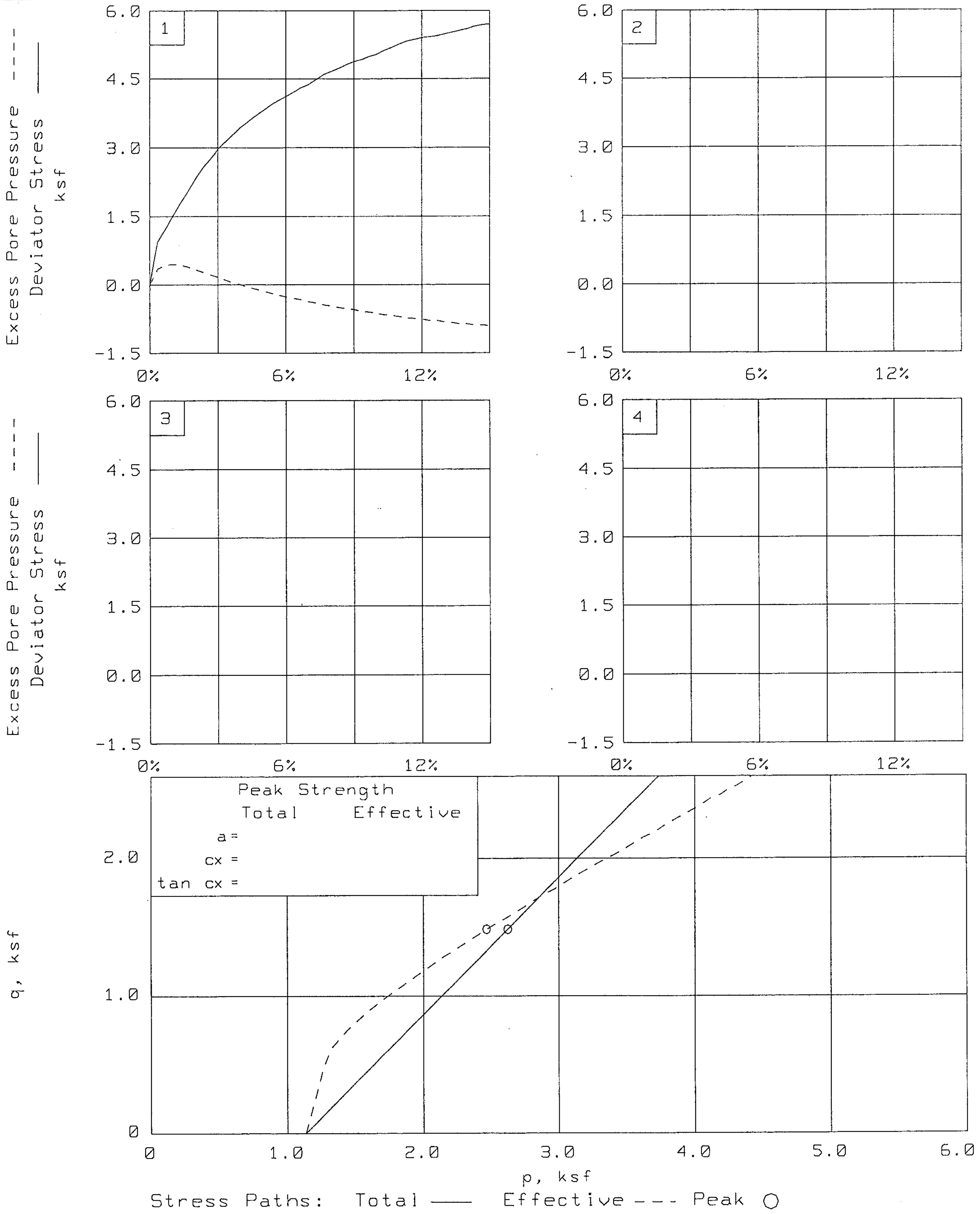
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: B-1 @ 10'

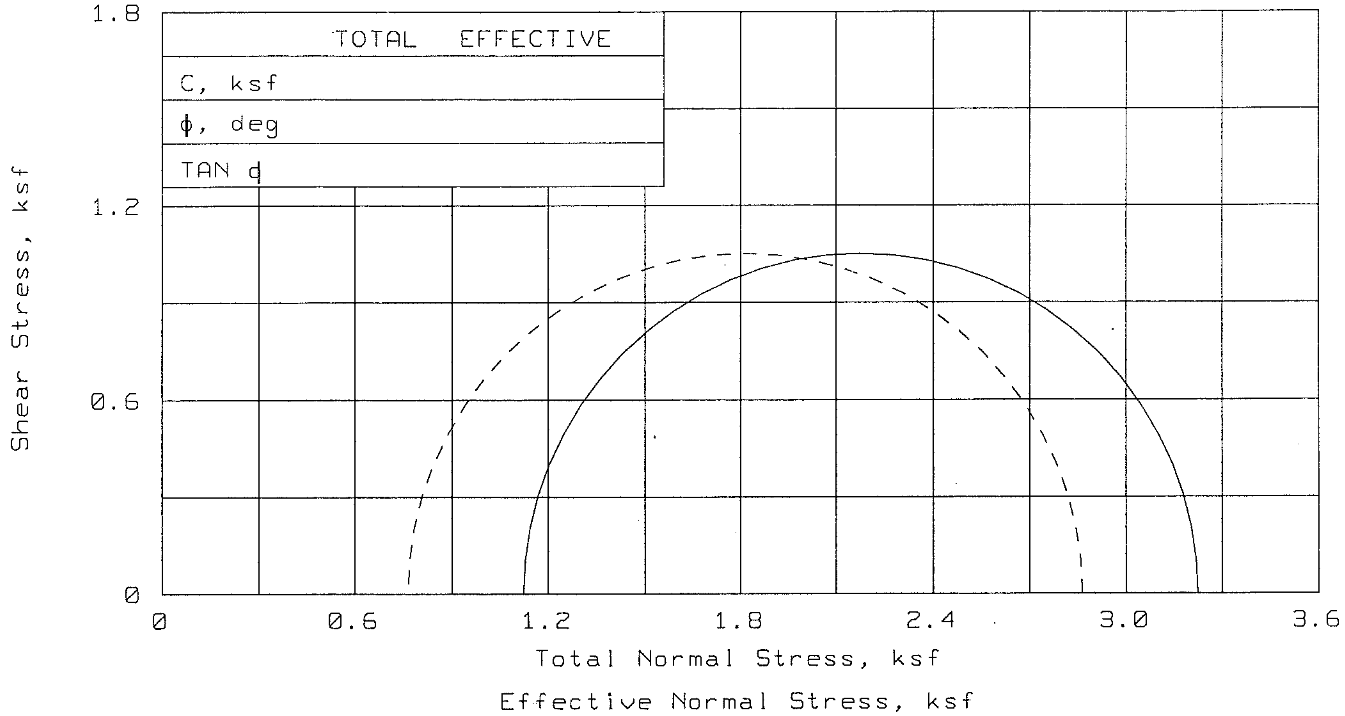
PROJ. NO.: 014-172h DATE: 8/07/04

TRIAXIAL SHEAR TEST REPORT

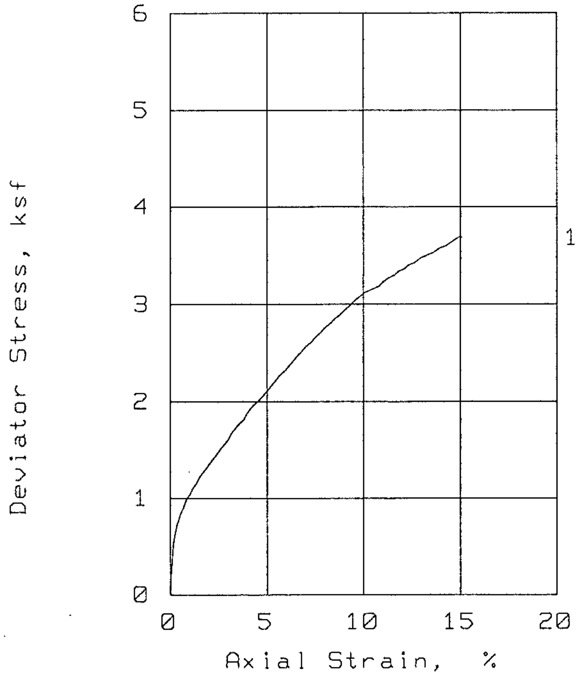
COOPER TESTING LABORATORY



Client: GRC
Project: Lower Penitencia Creek - 2047-100
Location: B-1 @ 10'
File: 014-172H Project No.: 014-172h Fig. No.: A1b



	TOTAL	EFFECTIVE
C, ksf		
ϕ, deg		
TAN d		



	SAMPLE NO.:	1
INITIAL	WATER CONTENT, %	30.1
	DRY DENSITY, pcf	92.4
	SATURATION, %	98.7
	VOID RATIO	0.824
	DIAMETER, in	2.870
	HEIGHT, in	6.000
AT TEST	WATER CONTENT, %	27.3
	DRY DENSITY, pcf	97.0
	SATURATION, %	100.0
	VOID RATIO	0.738
	DIAMETER, in	2.798
	HEIGHT, in	6.015
	Strain rate, %/min	0.03
	EFF CELL PRESSURE, ksf	1.123
	DEVIATOR STRESS, ksf	2.101
	EXCESS PORE PR., ksf	0.360
	STRAIN, %	5.0
	ULT. STRESS, ksf	
	EXCESS PORE PR., ksf	
	STRAIN, %	
	$\bar{\sigma}_1$ FAILURE, ksf	2.864
	$\bar{\sigma}_3$ FAILURE, ksf	0.763

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Brown Silty SAND

ASSUMED SPECIFIC GRAVITY= 2.7
REMARKS: Strengths picked at
5% strain.

Fig. No.: A2a

CLIENT: GRC

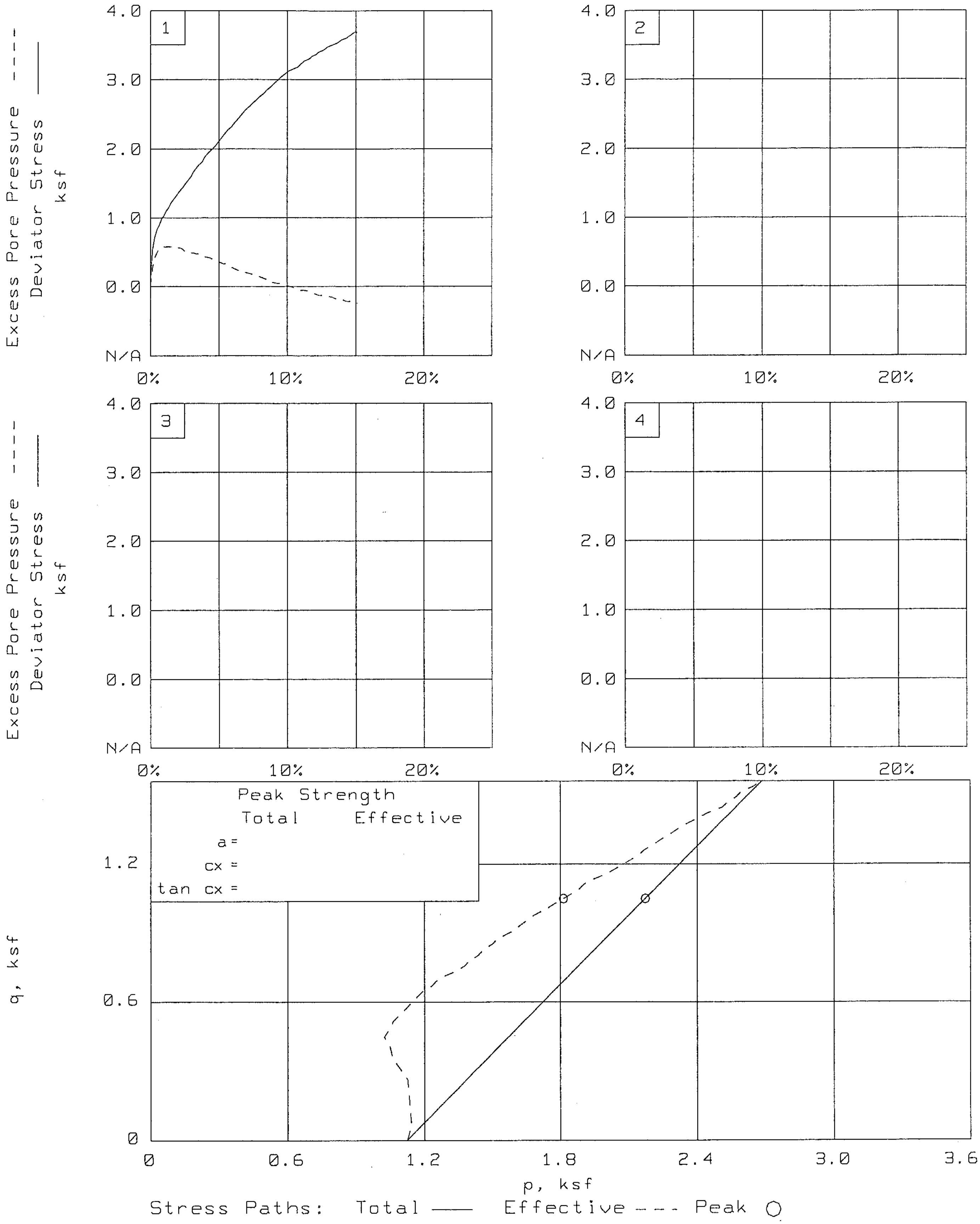
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: B-4 @ 12'

PROJ. NO.: 014-172j DATE: 8/07/04

TRIAXIAL SHEAR TEST REPORT

COOPER TESTING LABORATORY

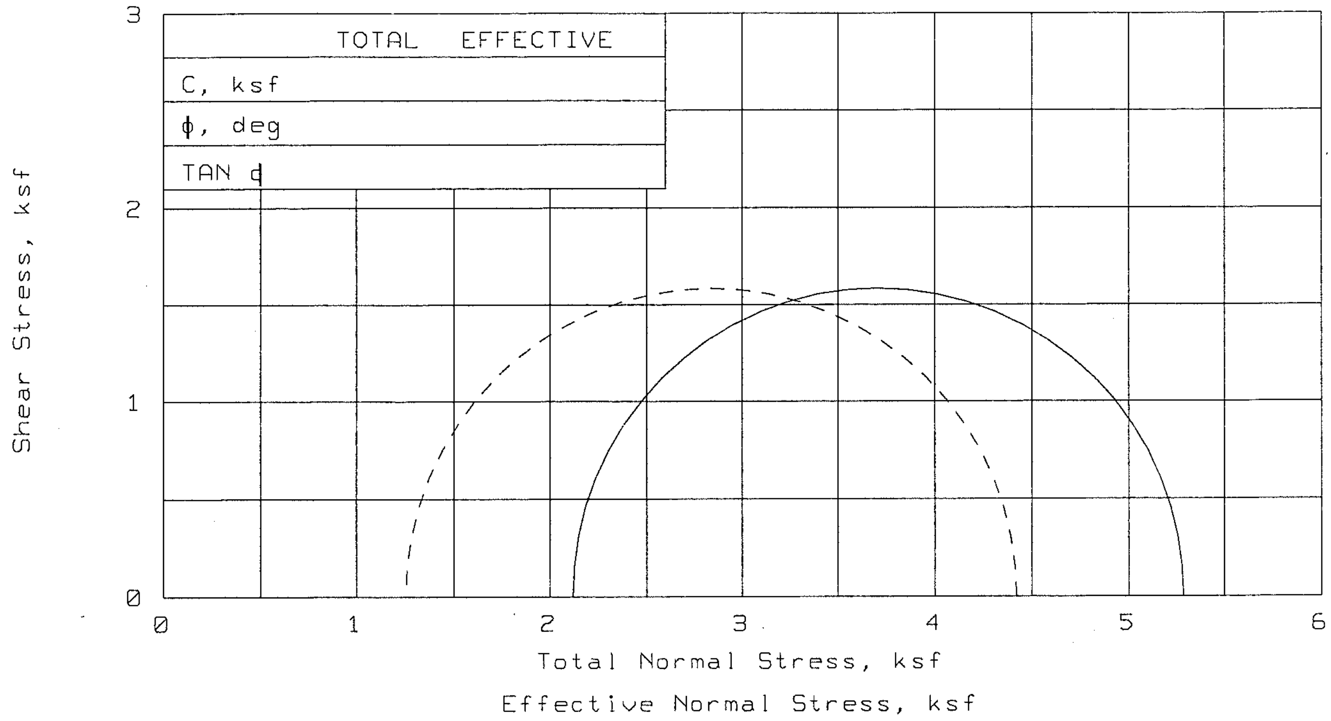


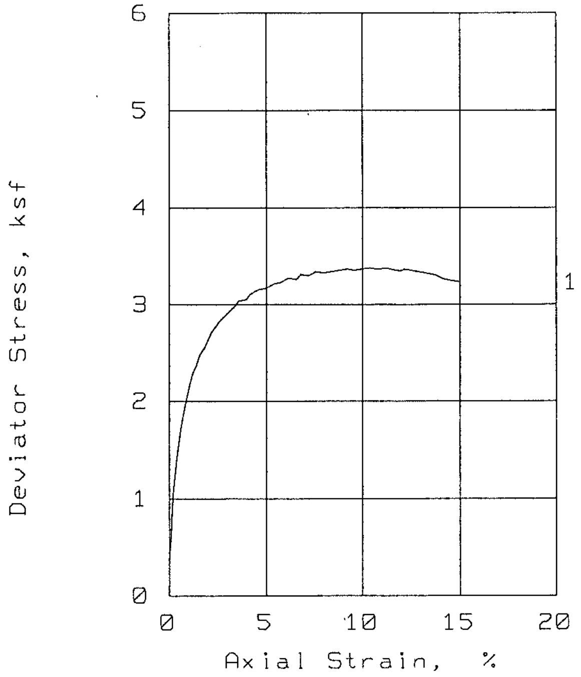
Client: GRC

Project: Lower Penitencia Creek - 2047-100

Location: B-4 @ 12'

File: 014-172J Project No.: 014-172j Fig. No.: A2b





SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	26.0
	DRY DENSITY, pcf	97.1
	SATURATION, %	95.4
	VOID RATIO	0.735
	DIAMETER, in	2.412
	HEIGHT, in	5.000
AT TEST	WATER CONTENT, %	28.2
	DRY DENSITY, pcf	95.8
	SATURATION, %	100.0
	VOID RATIO	0.760
	DIAMETER, in	2.426
	HEIGHT, in	5.015
Strain rate, %/min		0.02
EFF CELL PRESSURE, ksf		2.117
DEVIATOR STRESS, ksf		3.168
EXCESS PORE PR., ksf		0.864
STRAIN, %		5.0
ULT. STRESS, ksf		
EXCESS PORE PR., ksf		
STRAIN, %		
$\bar{\sigma}_1$ FAILURE, ksf		4.421
$\bar{\sigma}_3$ FAILURE, ksf		1.253

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Brown CLAY grading to CLAY with Sand

ASSUMED SPECIFIC GRAVITY= 2.7
REMARKS: Strengths picked at 5% strain.

Fig. No.: A3a

CLIENT: GRC

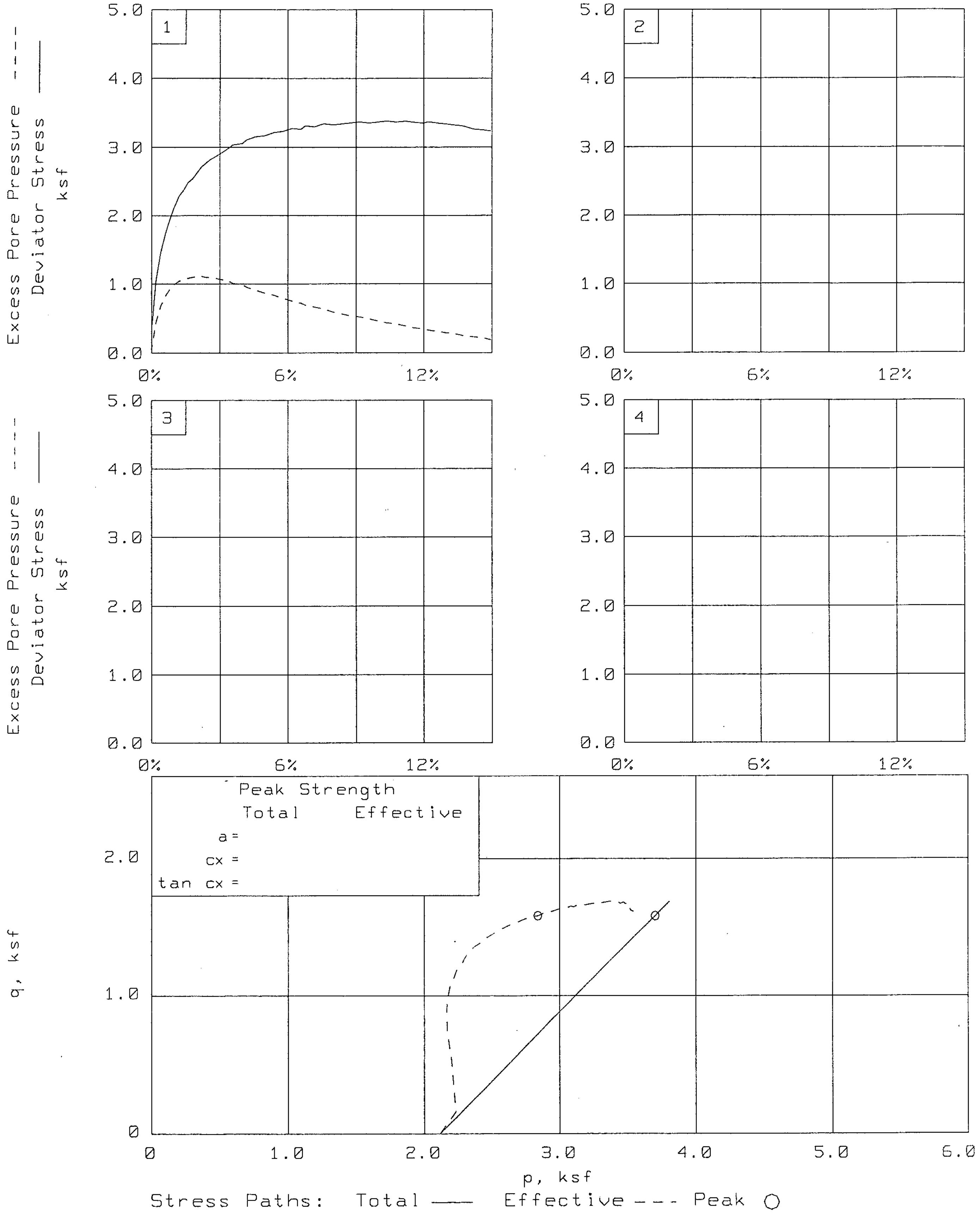
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: B-3 @ 6-6.5'

PROJ. NO.: 014-172f DATE: 8/9/04

TRIAXIAL SHEAR TEST REPORT

COOPER TESTING LABORATORY

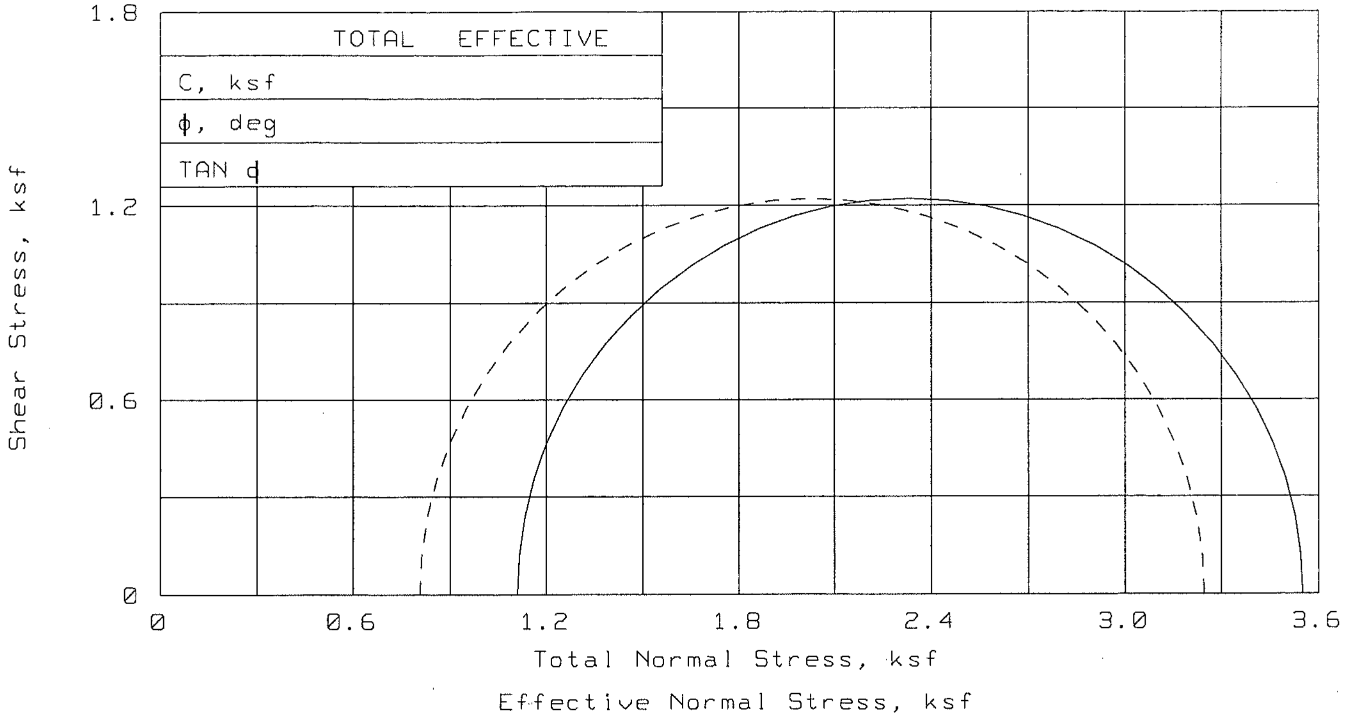


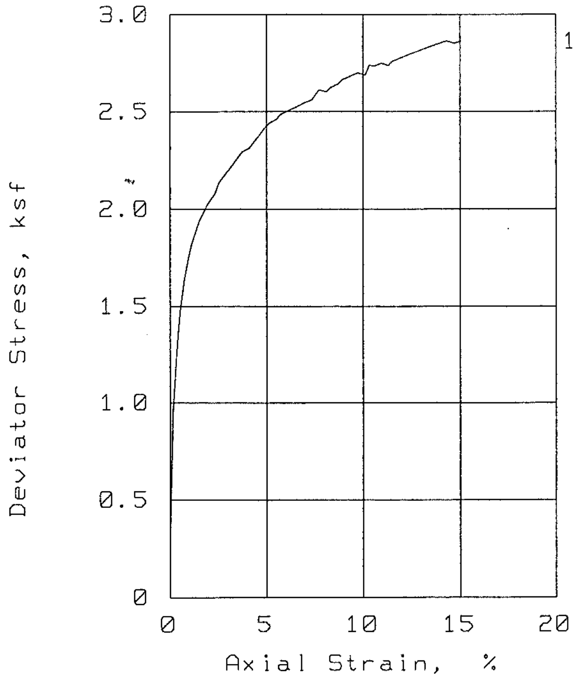
Client: GRC

Project: Lower Penitencia Creek - 2047-100

Location: B-3 @ 6-6.5'

File: 014-172F Project No.: 014-172f Fig. No.: A3b





SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	19.8
	DRY DENSITY, pcf	103.9
	SATURATION, %	85.8
	VOID RATIO	0.622
	DIAMETER, in	2.400
	HEIGHT, in	5.000
AT TEST	WATER CONTENT, %	22.6
	DRY DENSITY, pcf	104.7
	SATURATION, %	100.0
	VOID RATIO	0.610
	DIAMETER, in	2.393
	HEIGHT, in	4.991
Strain rate, %/min		0.02
EFF CELL PRESSURE, ksf		1.109
DEVIATOR STRESS, ksf		2.441
EXCESS PORE PR., ksf		0.302
STRAIN, %		5.1
ULT. STRESS, ksf		
EXCESS PORE PR., ksf		
STRAIN, %		
$\bar{\sigma}_1$ FAILURE, ksf		3.248
$\bar{\sigma}_3$ FAILURE, ksf		0.806

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Brown Sandy CLAY
grading to Dark Brown CLAY

ASSUMED SPECIFIC GRAVITY= 2.7
REMARKS: Strengths picked at
5% strain.

Fig. No.: A4a

CLIENT: GRC

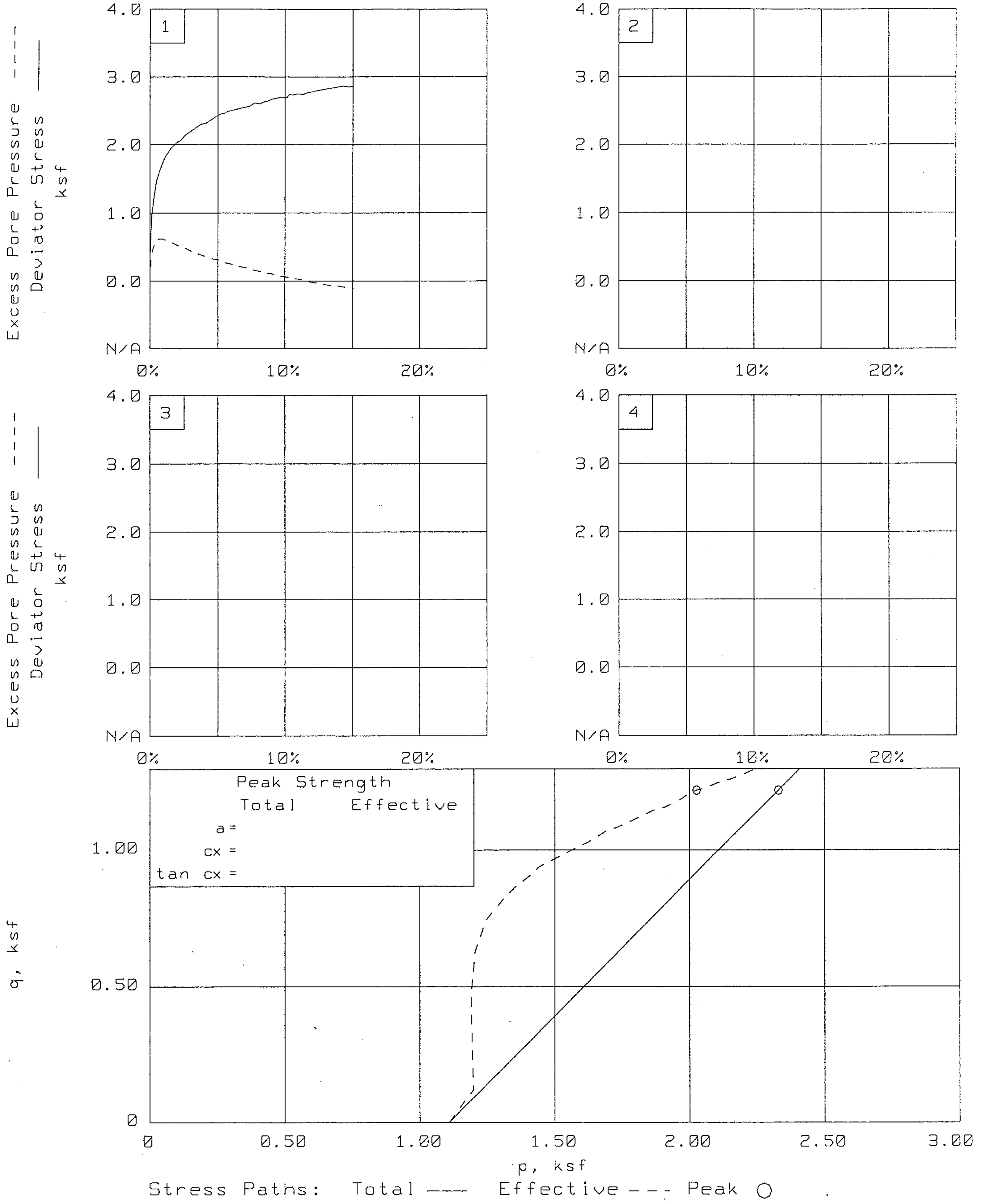
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: B-3 @ 5.5-6'

PROJ. NO.: 014-172e DATE: 8/7/04

TRIAXIAL SHEAR TEST REPORT

COOPER TESTING LABORATORY

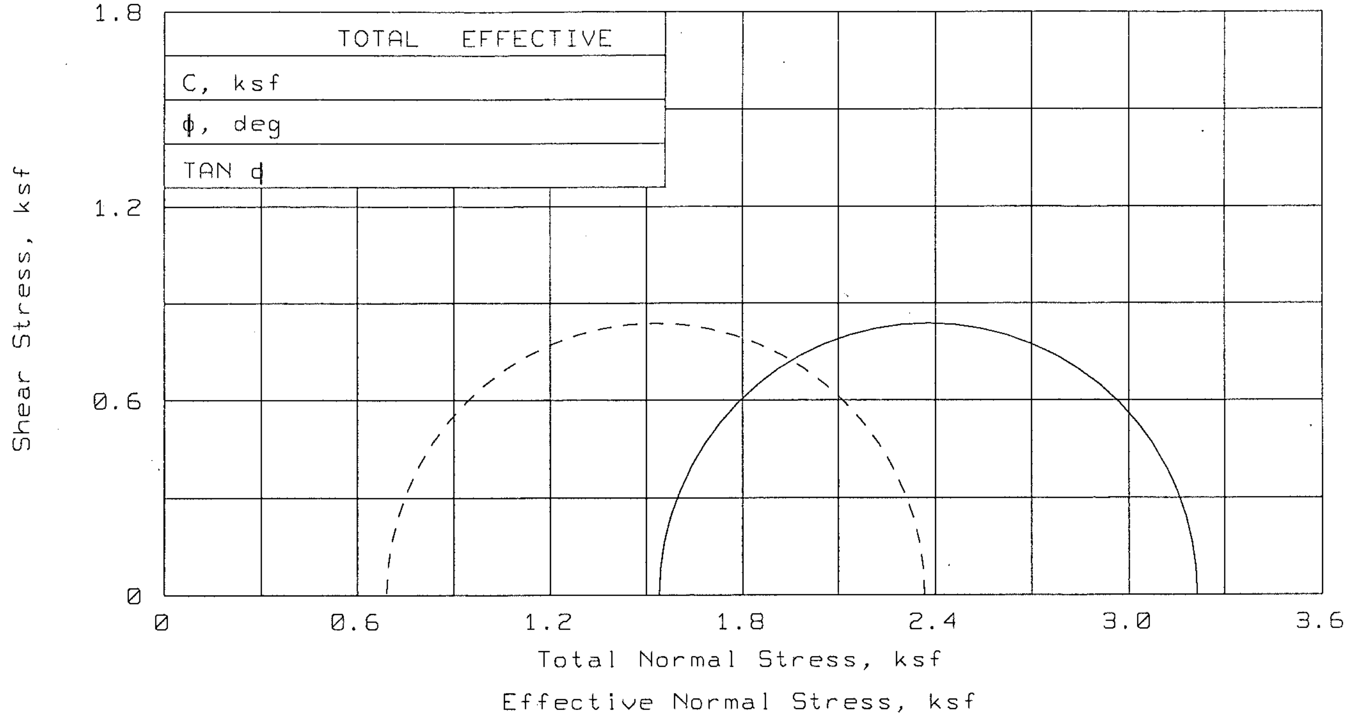


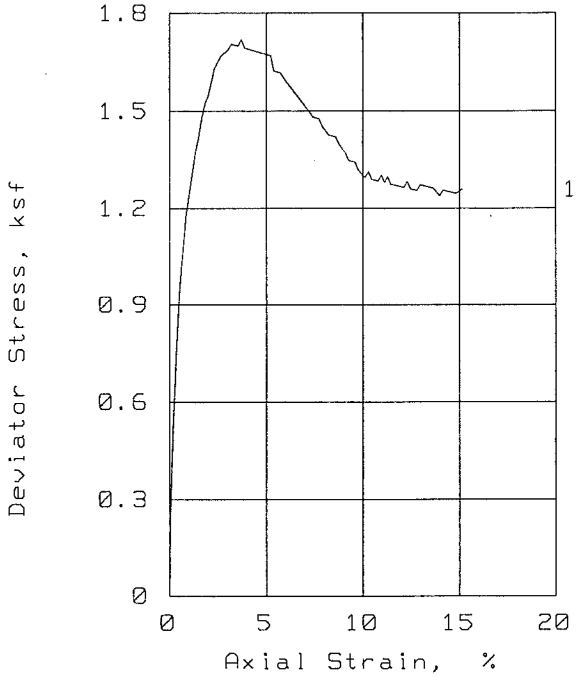
Client: GRC

Project: Lower Penitencia Creek - 2047-100

Location: B-3 @ 5.5-6'

File: 014-172E Project No.: 014-172e Fig. No.: A4b





	SAMPLE NO.:	1
INITIAL	WATER CONTENT, %	48.6
	DRY DENSITY, pcf	72.1
	SATURATION, %	98.1
	VOID RATIO	1.339
	DIAMETER, in	2.870
	HEIGHT, in	6.000
AT TEST	WATER CONTENT, %	46.1
	DRY DENSITY, pcf	75.1
	SATURATION, %	100.0
	VOID RATIO	1.244
	DIAMETER, in	2.826
	HEIGHT, in	5.936
	Strain rate, %/min	0.02
	EFF CELL PRESSURE, ksf	1.541
	DEVIATOR STRESS, ksf	1.675
	EXCESS PORE PR., ksf	0.850
	STRAIN, %	4.9
	ULT. STRESS, ksf	
	EXCESS PORE PR., ksf	
	STRAIN, %	
	$\bar{\sigma}_1$ FAILURE, ksf	2.366
	$\bar{\sigma}_3$ FAILURE, ksf	0.691

TYPE OF TEST:
CU with Pore Pressures

SAMPLE TYPE: Undisturbed

DESCRIPTION: Dark Gray CLAY

ASSUMED SPECIFIC GRAVITY= 2.7

REMARKS: Strengths picked at
5% strain.

Fig. No.: A5a

CLIENT: GRC

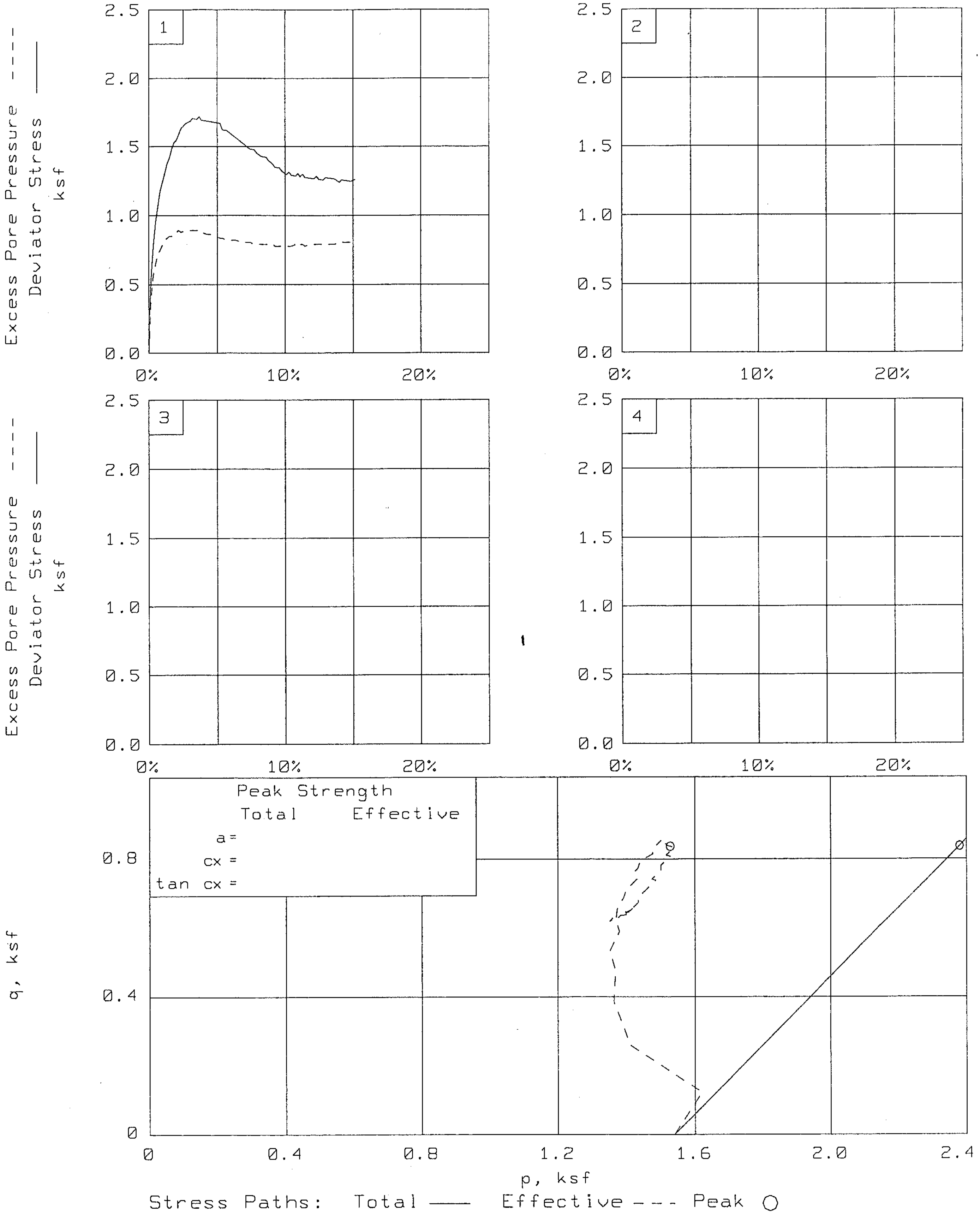
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: B-1 @ 15'

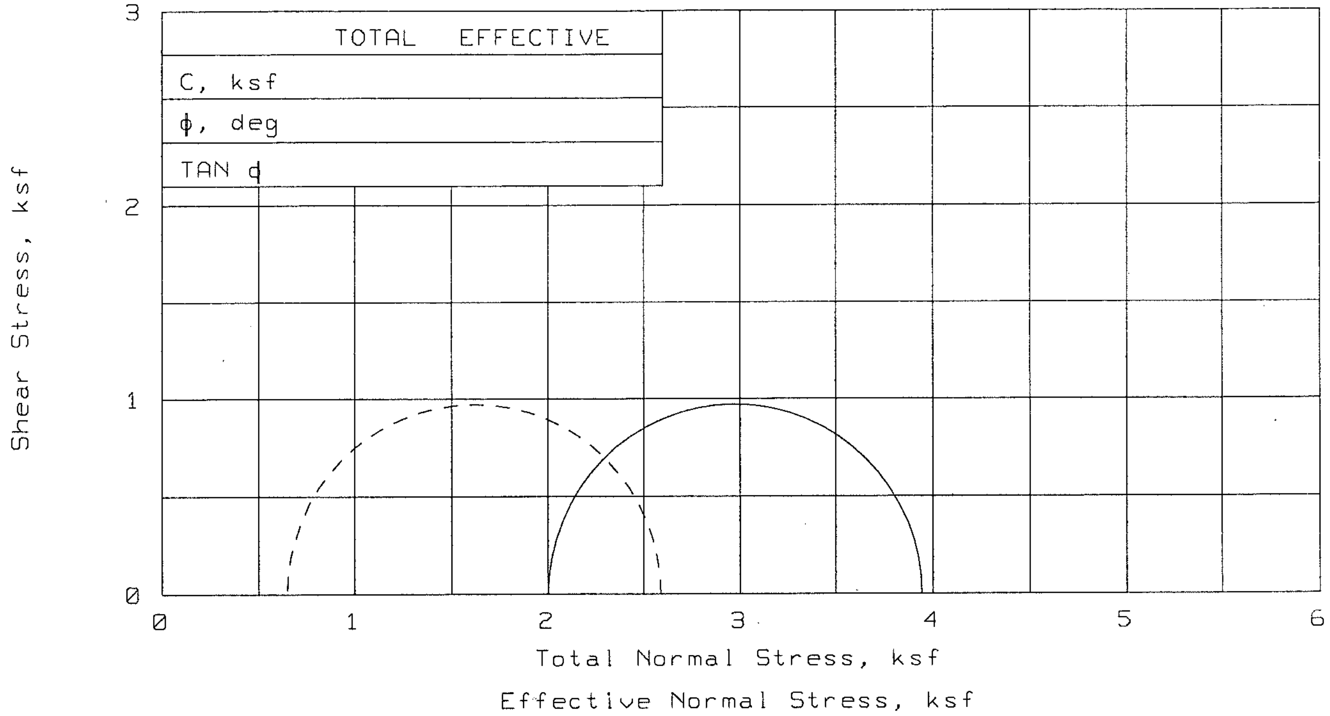
PROJ. NO.: 014-172g DATE: 8/07/04

TRIAXIAL SHEAR TEST REPORT

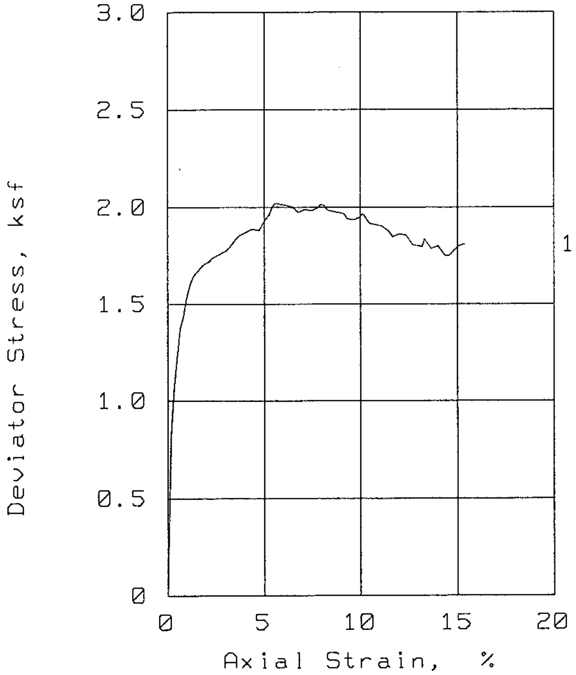
COOPER TESTING LABORATORY



Client: GRC
Project: Lower Penitencia Creek - 2047-100
Location: B-1 @ 15'
File: 014-172G Project No.: 014-172g Fig. No.: A5b



	TOTAL	EFFECTIVE
C, ksf		
ϕ, deg		
TAN ϕ		



SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	42.7
	DRY DENSITY, pcf	76.9
	SATURATION, %	96.9
	VOID RATIO	1.191
	DIAMETER, in	2.870
	HEIGHT, in	6.000
AT TEST	WATER CONTENT, %	37.7
	DRY DENSITY, pcf	83.5
	SATURATION, %	100.0
	VOID RATIO	1.019
	DIAMETER, in	2.776
	HEIGHT, in	5.910
Strain rate, %/min		0.02
EFF CELL PRESSURE, ksf		2.002
DEVIATOR STRESS, ksf		1.942
EXCESS PORE PR., ksf		1.354
STRAIN, %		5.1
ULT. STRESS, ksf		
EXCESS PORE PR., ksf		
STRAIN, %		
$\bar{\sigma}_1$ FAILURE, ksf		2.590
$\bar{\sigma}_3$ FAILURE, ksf		0.648

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Dark Gray CLAY
with pockets of Clayey SAND

ASSUMED SPECIFIC GRAVITY= 2.7
REMARKS: Strengths picked at
5% strain.

Fig. No.: A6a

CLIENT: GRC

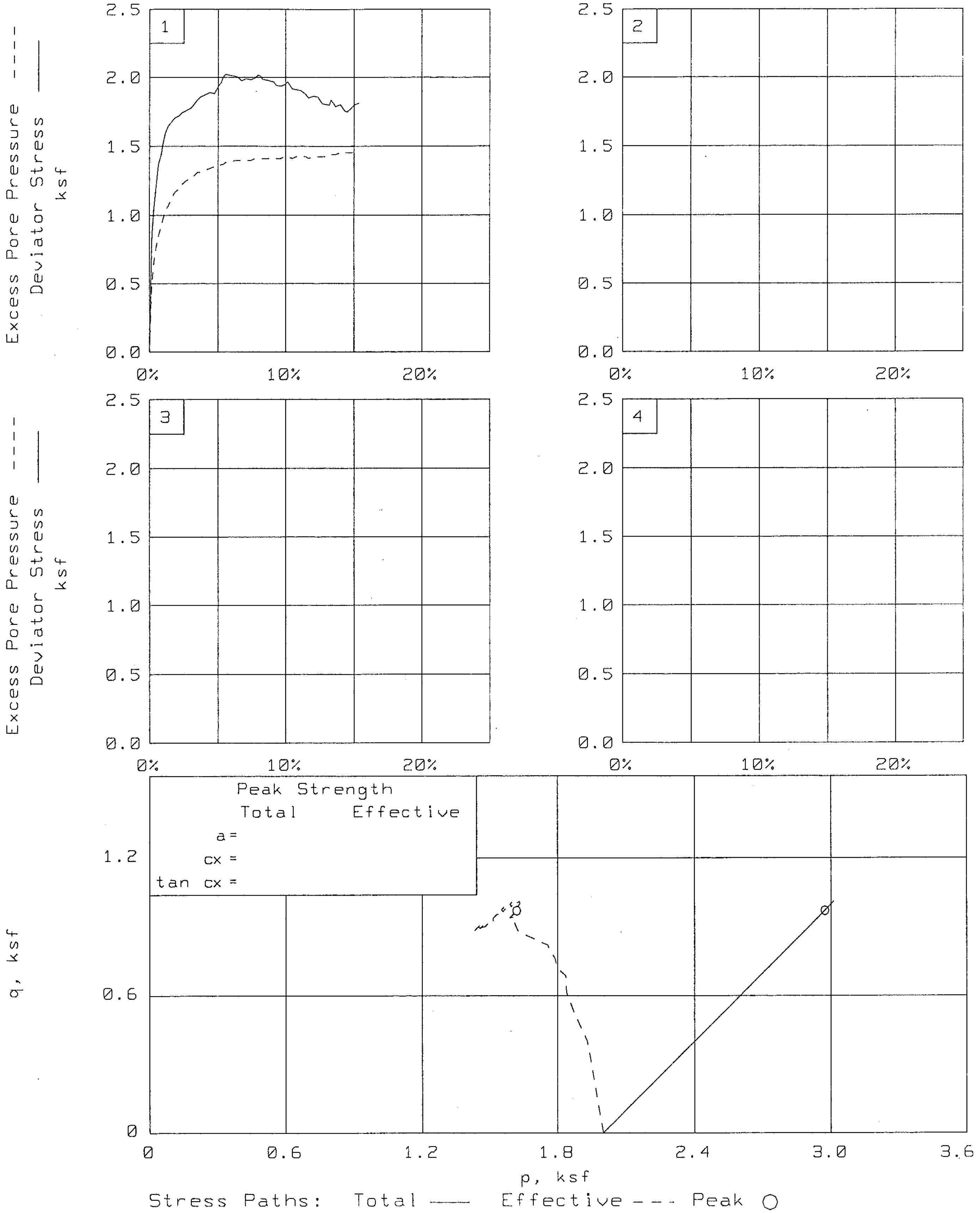
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: B-1 @ 20'

PROJ. NO.: 014-172i DATE: 8/07/04

TRIAXIAL SHEAR TEST REPORT

COOPER TESTING LABORATORY

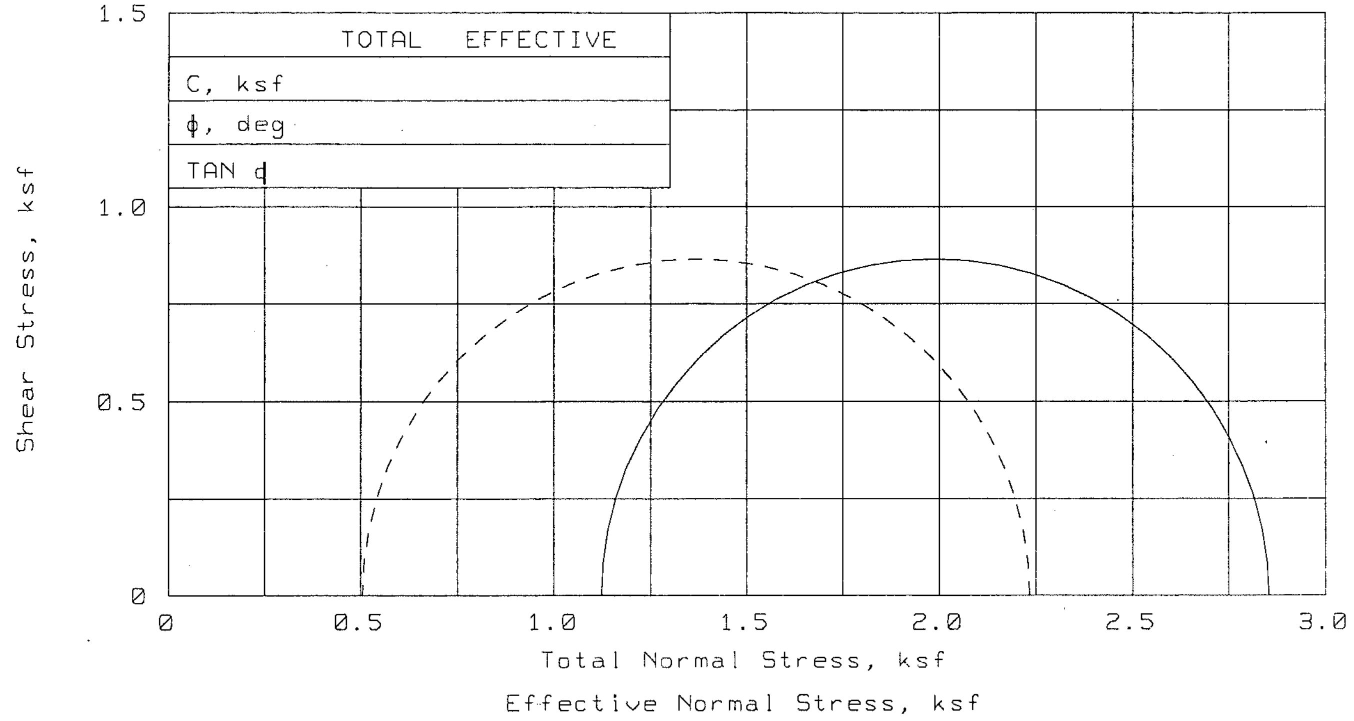


Client: GRC

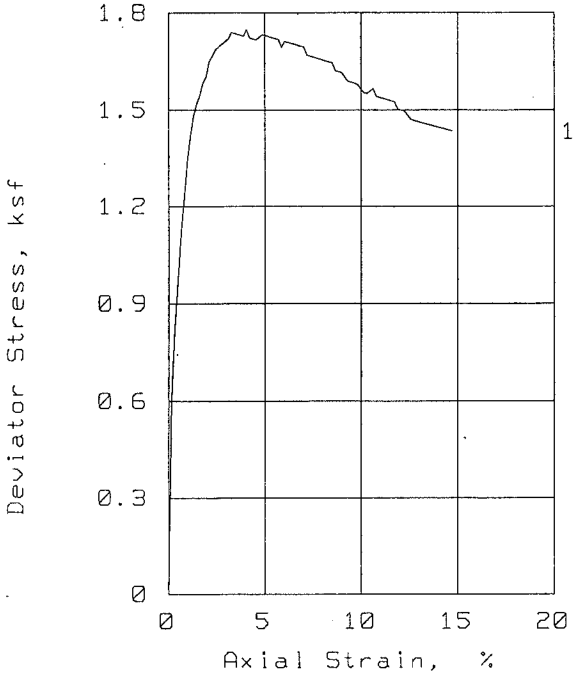
Project: Lower Penitencia Creek - 2047-100

Location: B-1 @ 20'

File: 014-172I Project No.: 014-172i Fig. No.: A6b



	TOTAL	EFFECTIVE
C, ksf		
ϕ, deg		
TAN ϕ		



	SAMPLE NO.:	1
INITIAL	WATER CONTENT, %	48.3
	DRY DENSITY, pcf	73.4
	SATURATION, %	99.4
	VOID RATIO	1.337
	DIAMETER, in	2.858
	HEIGHT, in	6.000
AT TEST	WATER CONTENT, %	46.5
	DRY DENSITY, pcf	75.3
	SATURATION, %	100.0
	VOID RATIO	1.280
	DIAMETER, in	2.809
	HEIGHT, in	6.058
	Strain rate, %/min	0.02
	EFF CELL PRESSURE, ksf	1.123
	DEVIATOR STRESS, ksf	1.730
	EXCESS PORE PR., ksf	0.619
	STRAIN, %	5.1
	ULT. STRESS, ksf	
	EXCESS PORE PR., ksf	
	STRAIN, %	
	$\bar{\sigma}_1$ FAILURE, ksf	2.234
	$\bar{\sigma}_3$ FAILURE, ksf	0.504

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Gray CLAY

ASSUMED SPECIFIC GRAVITY= 2.75
REMARKS: Strengths picked at
5% strain.

Fig. No.: A7a

CLIENT: GRC

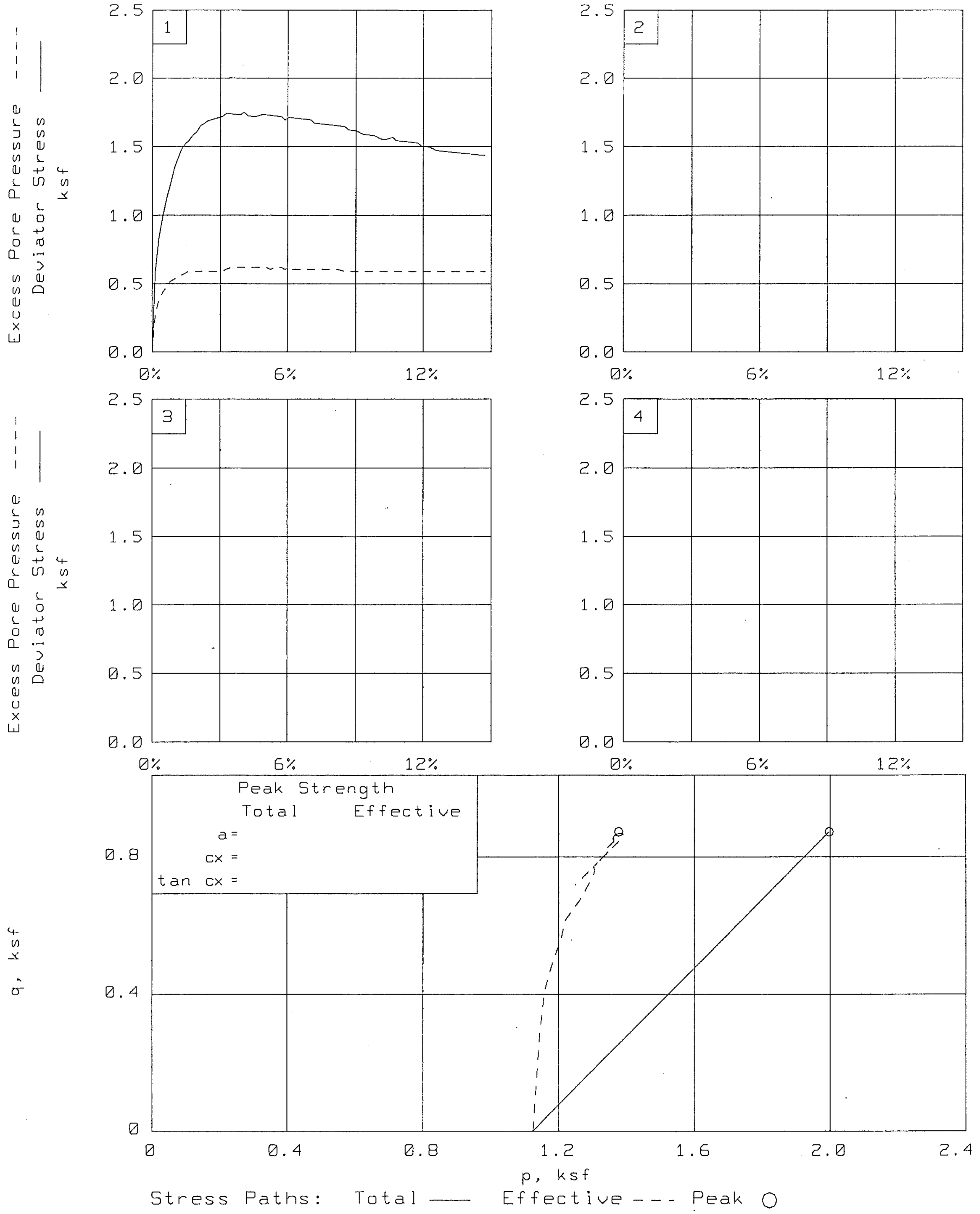
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: 1) B-2 @ 8.5' (bottom)

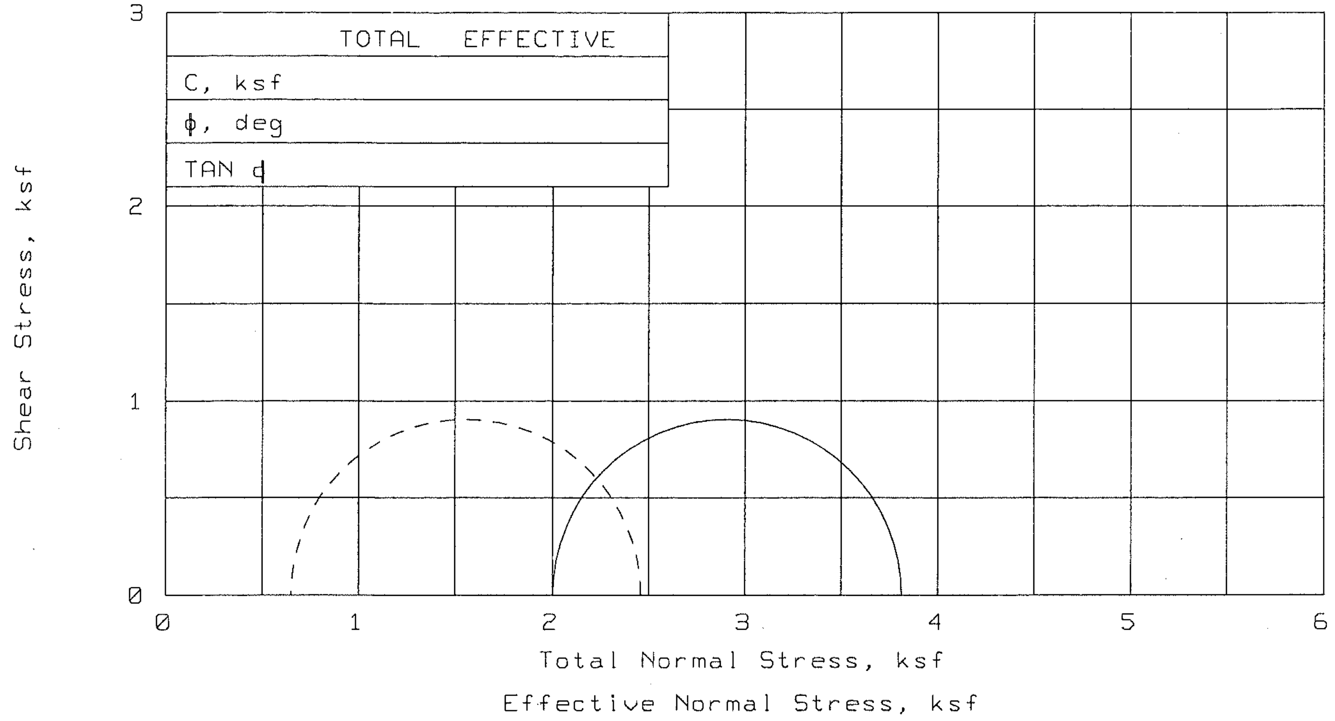
PROJ. NO.: 014-172a DATE: 8/07/04

TRIAXIAL SHEAR TEST REPORT

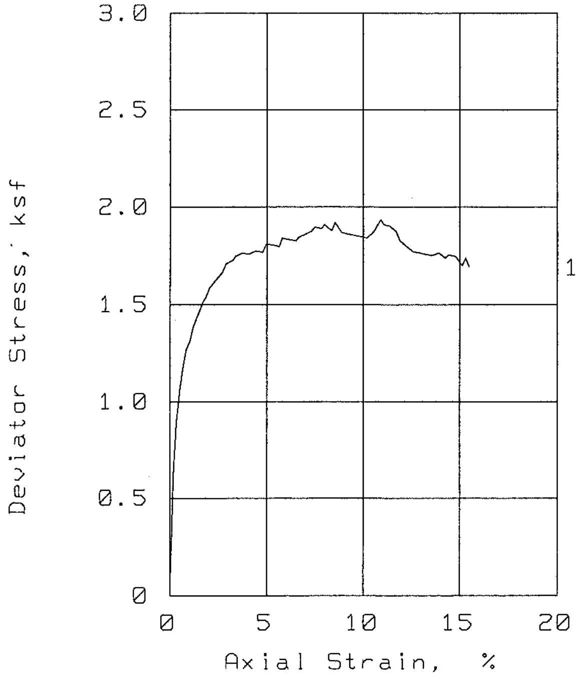
COOPER TESTING LABORATORY



Client: GRC
Project: Lower Penitencia Creek - 2047-100
Location: 1) B-2 @ 8.5' (bottom)
File: 014-172A Project No.: 014-172a Fig. No.: A7b



	TOTAL	EFFECTIVE
C, ksf		
ϕ, deg		
TAN ϕ		



	SAMPLE NO.:	1
INITIAL	WATER CONTENT, %	45.7
	DRY DENSITY, pcf	73.7
	SATURATION, %	95.9
	VOID RATIO	1.286
	DIAMETER, in	2.865
	HEIGHT, in	5.990
AT TEST	WATER CONTENT, %	39.5
	DRY DENSITY, pcf	81.6
	SATURATION, %	100.0
	VOID RATIO	1.066
	DIAMETER, in	2.757
	HEIGHT, in	5.844
	Strain rate, %/min	0.02
	EFF CELL PRESSURE, ksf	2.002
	DEVIATOR STRESS, ksf	1.811
	EXCESS PORE PR., ksf	1.354
	STRAIN, %	5.0
	ULT. STRESS, ksf	
	EXCESS PORE PR., ksf	
	STRAIN, %	
	$\bar{\sigma}_1$ FAILURE, ksf	2.459
	$\bar{\sigma}_3$ FAILURE, ksf	0.648

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Dark Gray CLAY
with pockets of Clayey SAND

ASSUMED SPECIFIC GRAVITY= 2.7
REMARKS: Strengths picked at
5% strain.

Fig. No.: A8a

CLIENT: GRC

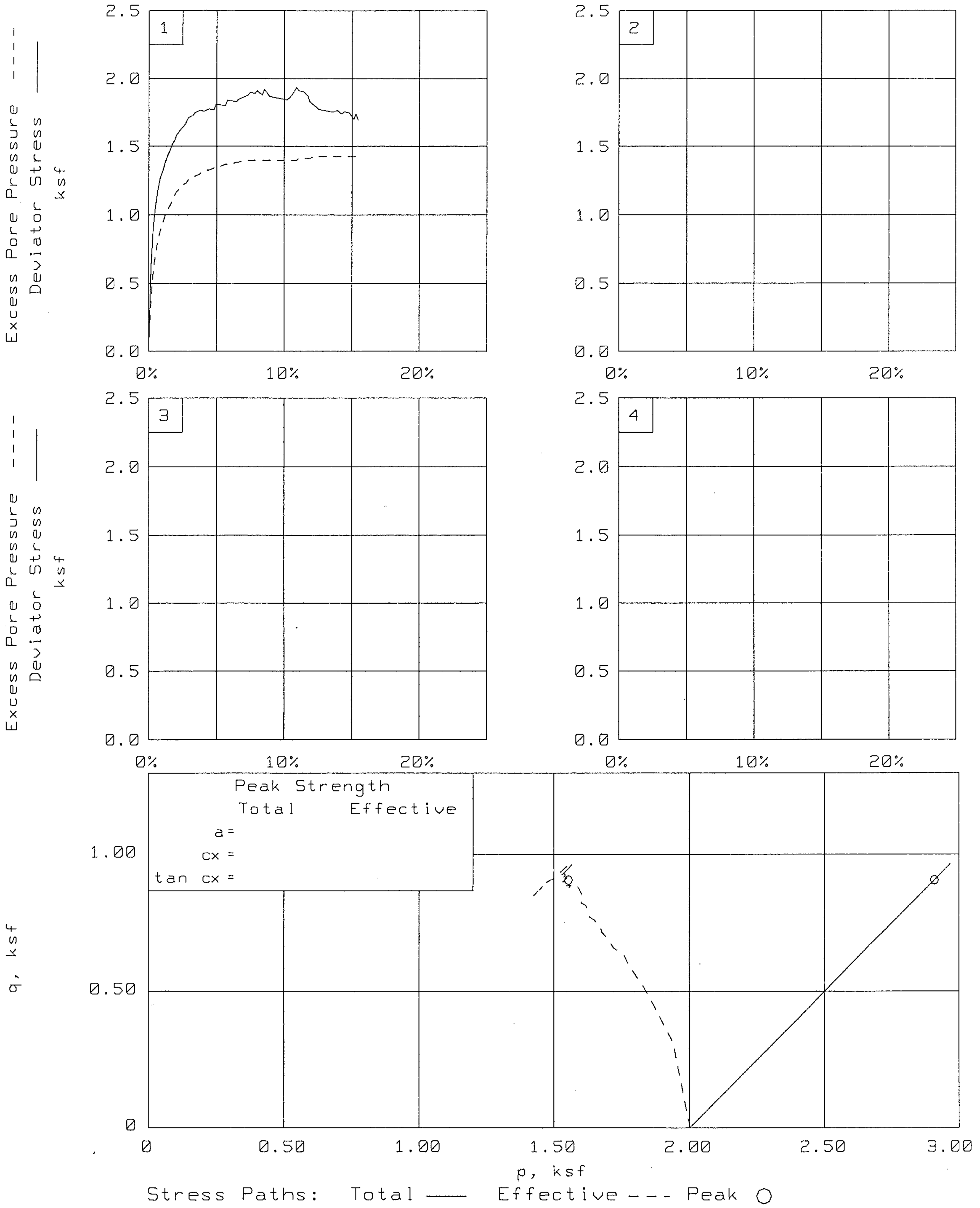
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: B-2 @ 11' (bottom)

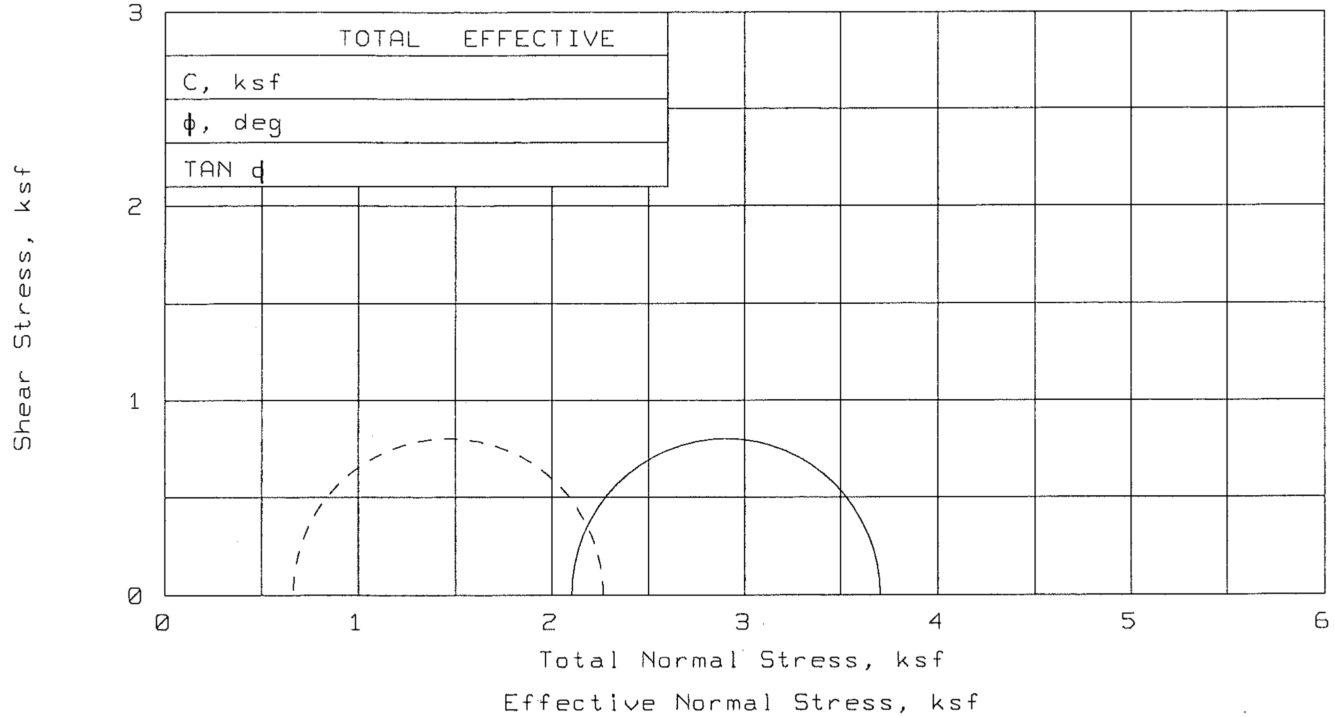
PROJ. NO.: 014-172b DATE: 8/07/04

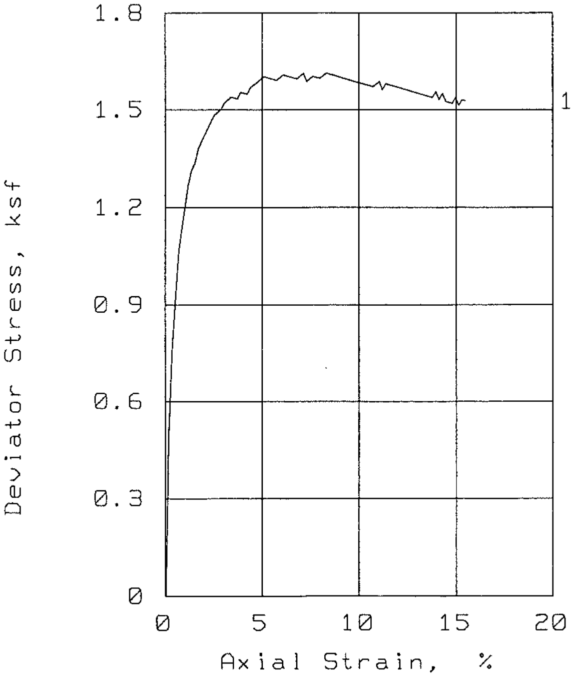
TRIAXIAL SHEAR TEST REPORT

COOPER TESTING LABORATORY



Client: GRC
Project: Lower Penitencia Creek - 2047-100
Location: B-2 @ 11' (bottom)
File: 014-172B Project No.: 014-172b Fig. No.: A8b





SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	42.7
	DRY DENSITY, pcf	77.8
	SATURATION, %	98.8
	VOID RATIO	1.167
	DIAMETER, in	2.865
	HEIGHT, in	6.000
AT TEST	WATER CONTENT, %	36.8
	DRY DENSITY, pcf	84.5
	SATURATION, %	100.0
	VOID RATIO	0.995
	DIAMETER, in	2.777
	HEIGHT, in	5.880
Strain rate, %/min		0.02
EFF CELL PRESSURE, ksf		2.102
DEVIATOR STRESS, ksf		1.602
EXCESS PORE PR., ksf		1.440
STRAIN, %		5.1
ULT. STRESS, ksf		
EXCESS PORE PR., ksf		
STRAIN, %		
$\bar{\sigma}_1$ FAILURE, ksf		2.265
$\bar{\sigma}_3$ FAILURE, ksf		0.662

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Dark Gray CLAY

ASSUMED SPECIFIC GRAVITY= 2.7
REMARKS: Strengths picked at 5% strain.

Fig. No.: A9a

CLIENT: GRC

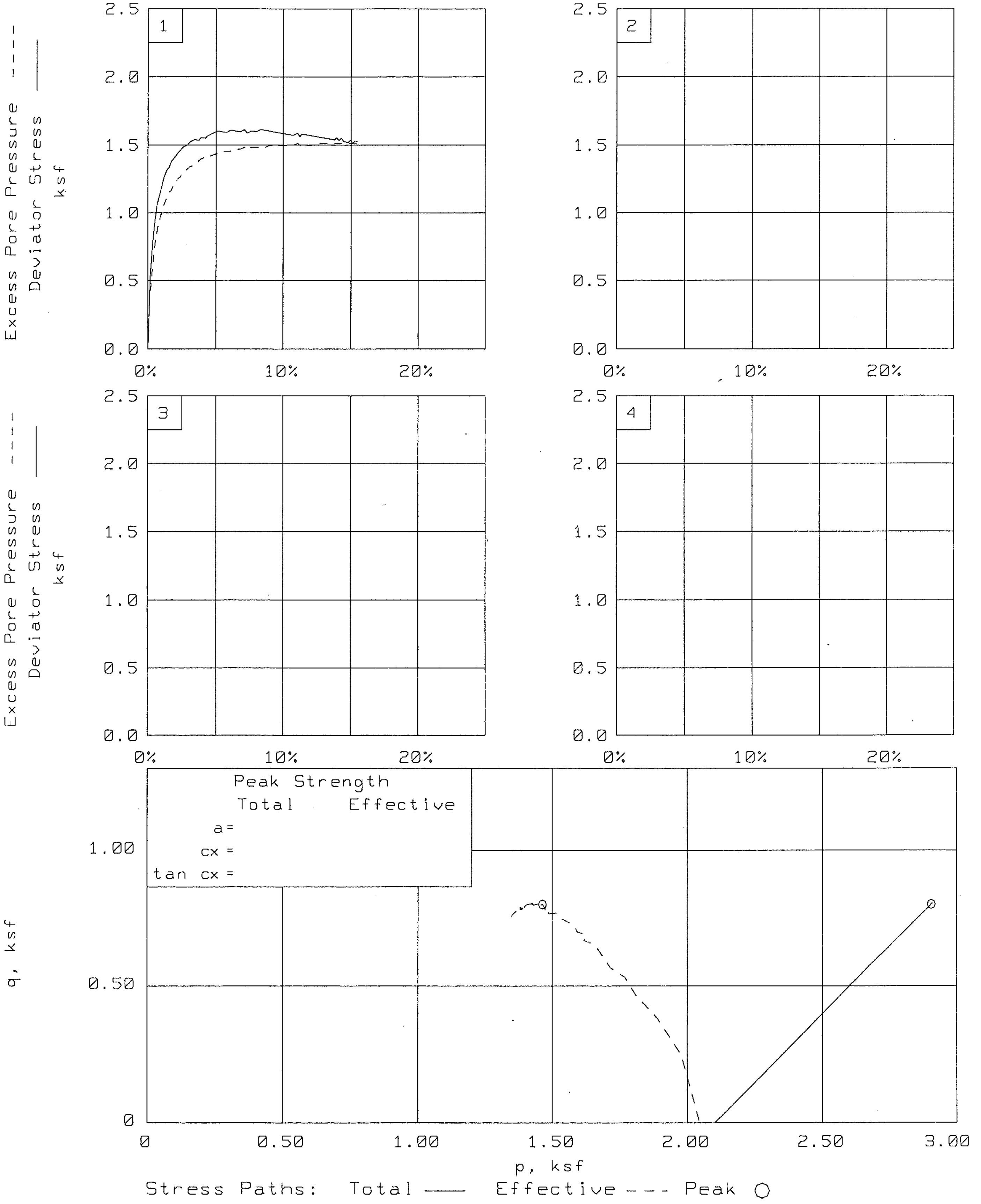
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: B-2 @ 11' (upper)

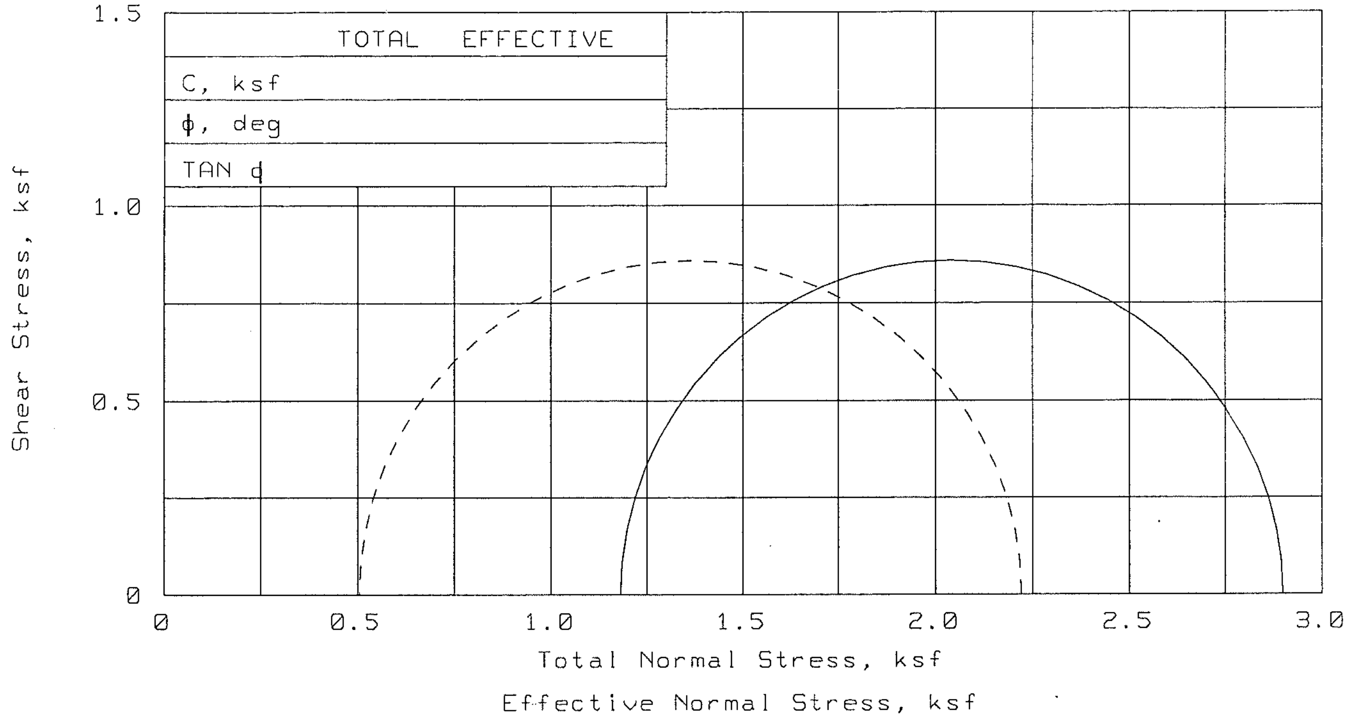
PROJ. NO.: 014-172c DATE: 8/07/04

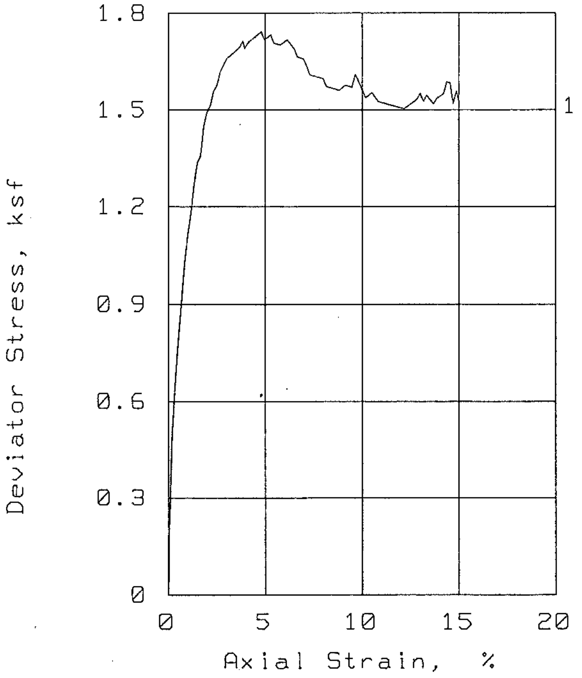
TRIAXIAL SHEAR TEST REPORT

COOPER TESTING LABORATORY



Client: GRC
Project: Lower Penitencia Creek - 2047-100
Location: B-2 @ 11' (upper)
File: 014-172C
Project No.: 014-172c
Fig. No.: A9b





SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	47.5
	DRY DENSITY, pcf	70.4
	SATURATION, %	92.0
	VOID RATIO	1.394
	DIAMETER, in	2.870
	HEIGHT, in	6.000
AT TEST	WATER CONTENT, %	45.7
	DRY DENSITY, pcf	75.4
	SATURATION, %	100.0
	VOID RATIO	1.235
	DIAMETER, in	2.785
	HEIGHT, in	5.948
Strain rate, %/min		0.02
EFF CELL PRESSURE, ksf		1.181
DEVIATOR STRESS, ksf		1.716
EXCESS PORE PR., ksf		0.677
STRAIN, %		5.0
ULT. STRESS, ksf		
EXCESS PORE PR., ksf		
STRAIN, %		
$\bar{\sigma}_1$ FAILURE, ksf		2.220
$\bar{\sigma}_3$ FAILURE, ksf		0.504

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Gray CLAY

ASSUMED SPECIFIC GRAVITY= 2.7
REMARKS: Strengths picked at 5% strain.

Fig. No.: A10a

CLIENT: GRC

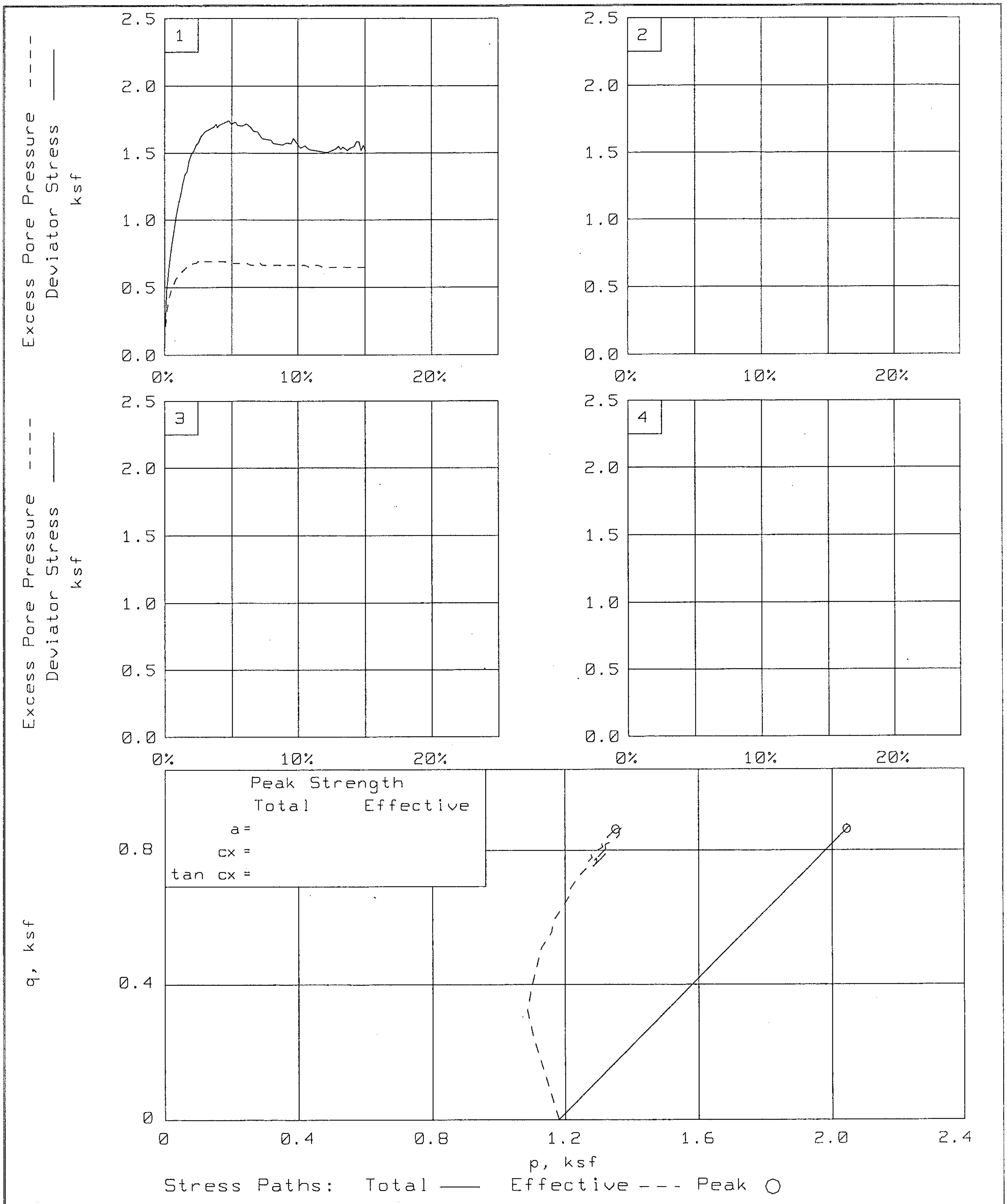
PROJECT: Lower Penitencia Creek - 2047-100

SAMPLE LOCATION: B-2 @ 8.5'(upper)

PROJ. NO.: 014-172d DATE: 8/07/04

TRIAXIAL SHEAR TEST REPORT

COOPER TESTING LABORATORY



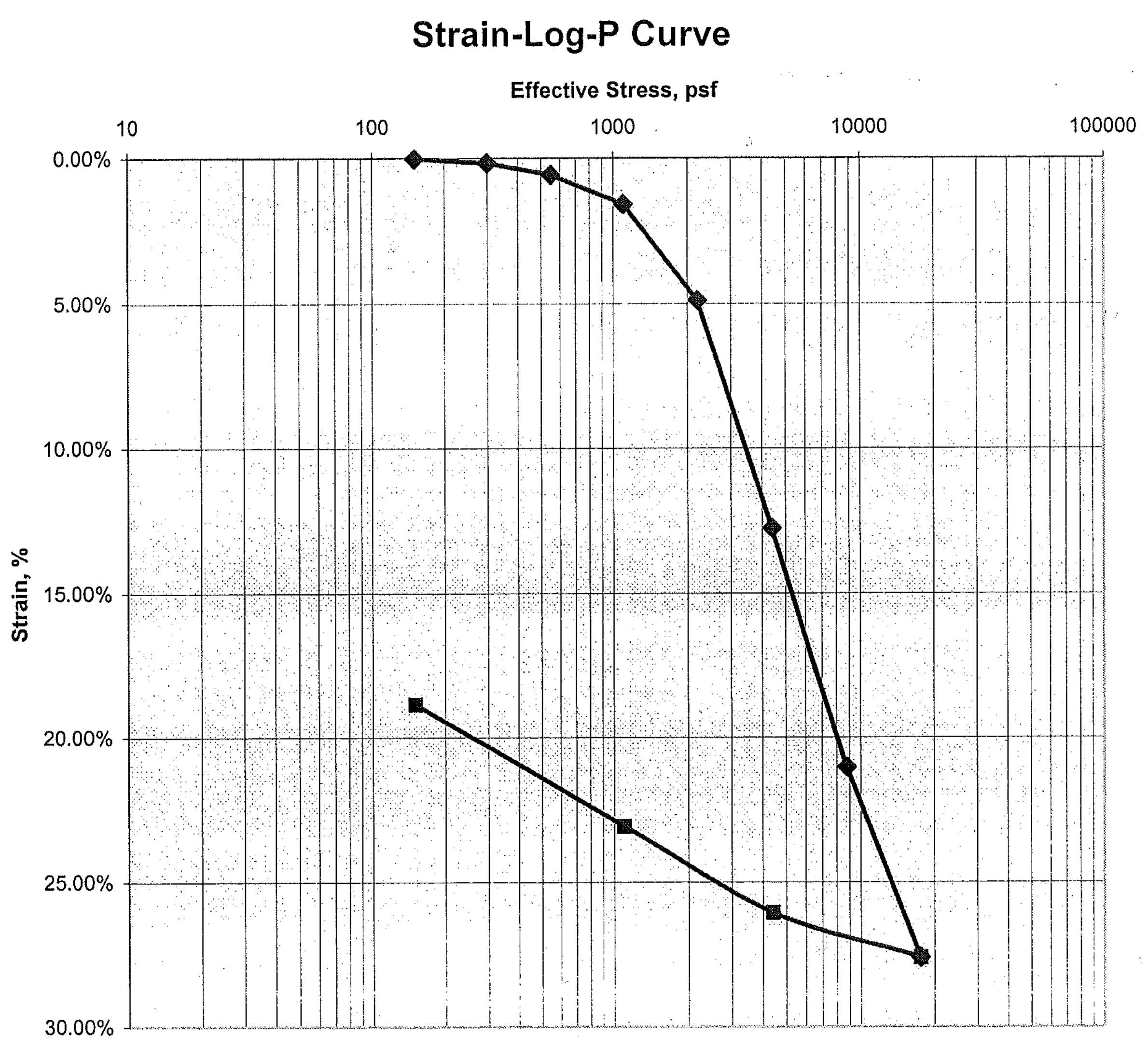
Client: GRC
Project: Lower Penitencia Creek - 2047-100
Location: B-2 @ 8.5'(upper)
File: 014-172D Project No.: 014-172d Fig. No.: A10b

COOPER TESTING LABORATORY

Consolidation Test

ASTM D2435

Job No.:	014-173	**Boring:**	1	**Run By:**	MD
Client:	Geo/Resource Consultants	**Sample:**		**Reduced:**	DC
Project:	Lower Penitencia Levee - 2047-100	**Depth, ft.:**	20	**Checked:**	DC
Soil Type:	Dark Gray Mottled Gray CLAY			**Date:**	8/28/2004



Ass. Gs = 2.75	**Initial**	**Final**
Moisture %:	54.7	39.0
Density, pcf:	68.3	82.9
Void Ratio:	1.514	1.071
% Saturation:	99.4	100

Remarks:

Fig. No.: A11

COOPER
TESTING LABORATORY

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	014-173	**Boring:**	B-1	**Date:**	09/16/04
Client:	GeoResource Consultants	**Sample:**		**By:**	MD/PJ
Project:	Lower Penitencia Levee	**Depth'**	10.0	**Remolded:**	

Visual Classification: Brown Clayey SAND

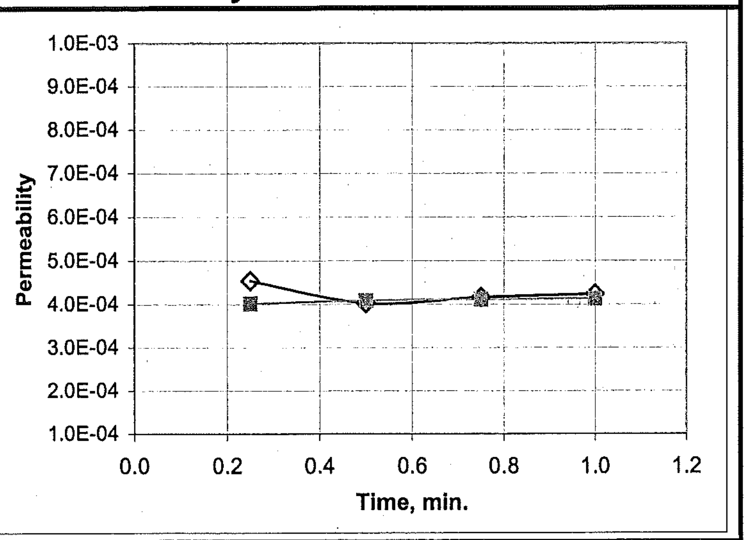
Max Sample Pressures, psi:

Cell:	Bottom	Top	Avg. Sigma 3
53.5	49	48	5

Date	Minutes	Head, (in)	K,cm/sec
	0.00	98.33	Start of Test
	0.25	89.33	4.5E-04
	0.50	82.93	4.0E-04
	0.75	75.53	4.2E-04
	1.00	68.73	4.2E-04
	0.25	90.33	4.0E-04
	0.50	82.73	4.1E-04
	0.75	75.73	4.1E-04
	1.00	69.33	4.1E-04

B: = >0.95 **("B" is an indication of saturation)**

Max Hydraulic Gradient: = 13



Average Permeability: **4.E-04** **cm/sec**

Sample Data:	Initial		Final
Height, in	3.00		2.99
Diameter, in	2.87		2.86
Area, in2	6.47		6.42
Volume in3	19.41		19.23
Total Volume, cc	318.0		315.2
Volume Solids, cc	187.6		187.6
Volume Voids, cc	130.4		127.6
Void Ratio	0.7		0.7
Porosity, %	41.0		40.5
Saturation, %	74.1		94.1
Specific Gravity	2.65	Assumed	2.65
Wet Weight, gm	593.8		617.3
Dry Weight, gm	497.2		497.2
Tare, gm	0.00		0.00
Moisture, %	19.4		24.2
Dry Density, pcf	97.6		98.4

Remarks:

Fig. No.: A12

APPENDIX B
SLOPE STABILITY ANALYSIS

END OF CONSTRUCTION (EOC)

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               ***********************************************
               * ******************************************* *
               * *                                         * *
               * *     -------------------------------     * *
               * *      TSTAB  slope stability analysis    * *
               * *         Revision 2.52 - 01/06/86        * *
               * *     -------------------------------     * *
               * *                                         * *
               * ******************************************* *
               ***********************************************


 *********************************************************************
   P.C. Levee - Case A - EoC
 *********************************************************************


 ******************************************
   ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
 ******************************************


 **************
   INPUT DATA
 **************


  CONTROL DATA,
       AUTOMATIC SEARCH FOR CRITICAL CIRCLE
       NUMBER OF DEPTH LIMITING TANGENTS                1
       NUMBER OF VERTICAL SECTIONS                      6
       NUMBER OF SOIL LAYER BOUNDARIES                  4
       NUMBER OF POINTS DEFINING COHESION PROFILE       0
       NUMBER OF CURVES DEFINING COHESION ANISOTROPY    0
       NUMBER OF BOUNDARY LINE LOADS                    0
       NUMBER OF BOUNDARY PRESSURE LOADS                0

       SEISMIC COEFFICIENT                    =        .000
       ATMOSPHERIC PRESSURE                   =        .000
       UNIT WEIGHT OF WATER                   =      62.400
       UNIT WEIGHT OF WATER IN TENSION CRACK =       62.400

  SEARCH STARTS AT CENTER (  25.0,  -5.0),WITH FINAL GRID OF  2.0

  ALL CIRCLES TANGENT TO DEPTH,  25.0,

  GEOMETRY

      SECTIONS     -30.00   -15.00      .00    10.00    32.50    60.00

      T. CRACKS     10.00    10.00      .10      .10    15.00    15.00
      W IN CRACK    10.00    10.00      .10      .10    15.00    15.00
      BOUNDARY 1    10.00    10.00      .10      .10    15.00    15.00
      BOUNDARY 2    15.00    15.00    15.00    15.00    15.00    15.00
      BOUNDARY 3    25.00    25.00    25.00    25.00    25.00    25.00
      BOUNDARY 4    30.00    30.00    30.00    30.00    30.00    30.00

  SOIL PROPERTIES

       LAYER   DENSITY    COHESION  FRICTION ANGLE  DELTA PHI
         1      120.00     680.00         14.00           .00
         2      109.00     900.00           .00           .00
         3      130.00    2000.00         15.00           .00

  PORE PRESSURE DATA

      PHREATIC SURFACE OPTION

      SECTIONS     -30.00   -15.00      .00    10.00    32.50    60.00
      Y-COORDINATE OF PHREATIC
      SURFACE       15.00    15.00    15.00    15.00    15.00    15.00
```

```
***********
  RESULTS
***********


****************************************************
  DEPTH LIMITING TANGENT NO.  1  AT Y =    25.00
****************************************************


 NUMBER  TANGENT  RADIUS   (X) CENTER  (Y) CENTER      F.S.

    1      25.0     30.0       25.0        -5.0       2.942
    2      25.0     30.0       21.0        -5.0       3.015
    3      25.0     34.0       25.0        -9.0       3.011
    4      25.0     30.0       29.0        -5.0       3.146
    5      25.0     26.0       25.0        -1.0       2.967
    6      25.0     30.0       23.0        -5.0       2.945
    7      25.0     32.0       25.0        -7.0       2.968
    8      25.0     30.0       27.0        -5.0       3.006
    9      25.0     28.0       25.0        -3.0       2.940
   10      25.0     28.0       23.0        -3.0       2.917
   11      25.0     28.0       27.0        -3.0       3.038
   12      25.0     26.0       25.0        -1.0       2.967
   13      25.0     28.0       21.0        -3.0       2.966
   14      25.0     30.0       23.0        -5.0       2.945
   15      25.0     26.0       23.0        -1.0       2.914
   16      25.0     26.0       21.0        -1.0       2.940
   17      25.0     26.0       25.0        -1.0       2.967
   18      25.0     24.0       23.0         1.0      CENTER BELOW INTERPOLATED CRACK
   19      25.0     28.0       21.0        -3.0       2.966
   20      25.0     28.0       25.0        -3.0       2.940
   21      25.0     24.0       25.0         1.0      CENTER BELOW INTERPOLATED CRACK
   22      25.0     24.0       21.0         1.0       2.937
 F.S. MINIMUM= 2.914 FOR THE CIRCLE OF CENTER (  23.0,  -1.0)

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 Execution complete, time =      .11 seconds
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Fig. No.: B1b

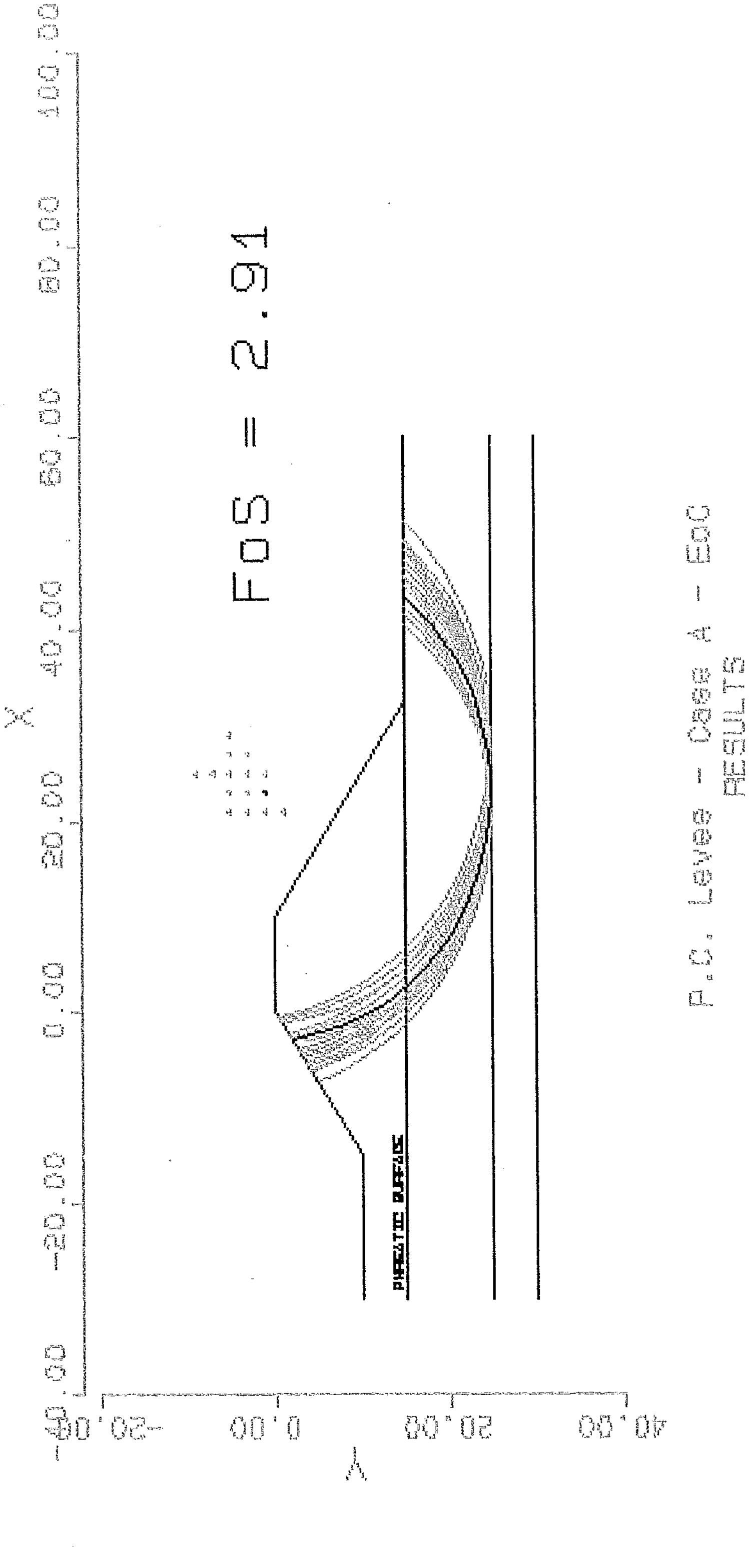
FoS = 2.91
PHREATIC SURFACE
X
-40.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
Y
-20.00
0.00
20.00
40.00
P.C. Levee - Case A - EoC
RESULTS

Fig. No.: B1c

LONG TERM STATIC (LTS)

```
             ***********************************************
             * ******************************************* *
             * *                                       * *
             * *    ---------------------------------    * *
             * *     TSTAB  slope stability analysis     * *
             * *        Revision 2.52 - 01/06/86         * *
             * *    ---------------------------------    * *
             * *                                       * *
             * ******************************************* *
             ***********************************************


*********************************************************************
  P.C. Levee - Case A - LST
*********************************************************************


******************************************
  ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
******************************************


**************
  INPUT DATA
**************


 CONTROL DATA,
      AUTOMATIC SEARCH FOR CRITICAL CIRCLE
      NUMBER OF DEPTH LIMITING TANGENTS                1
      NUMBER OF VERTICAL SECTIONS                      6
      NUMBER OF SOIL LAYER BOUNDARIES                  4
      NUMBER OF POINTS DEFINING COHESION PROFILE       0
      NUMBER OF CURVES DEFINING COHESION ANISOTROPY    0
      NUMBER OF BOUNDARY LINE LOADS                    0
      NUMBER OF BOUNDARY PRESSURE LOADS                0

      SEISMIC COEFFICIENT                   =        .000
      ATMOSPHERIC PRESSURE                  =        .000
      UNIT WEIGHT OF WATER                  =      62.400
      UNIT WEIGHT OF WATER IN TENSION CRACK =      62.400

 SEARCH STARTS AT CENTER (   25.0,   -5.0),WITH FINAL GRID OF   2.0

 ALL CIRCLES TANGENT TO DEPTH,  25.0,

 GEOMETRY

     SECTIONS     -30.00   -15.00      .00    10.00    32.50    60.00

     T. CRACKS     10.00    10.00      .10      .10    15.00    15.00
     W IN CRACK    10.00    10.00      .10      .10    15.00    15.00
     BOUNDARY 1    10.00    10.00      .10      .10    15.00    15.00
     BOUNDARY 2    15.00    15.00    15.00    15.00    15.00    15.00
     BOUNDARY 3    25.00    25.00    25.00    25.00    25.00    25.00
     BOUNDARY 4    30.00    30.00    30.00    30.00    30.00    30.00

 SOIL PROPERTIES

      LAYER   DENSITY    COHESION  FRICTION ANGLE  DELTA PHI
        1      120.00      300.00       27.00         .00
        2      109.00         .00       34.00         .00
        3      130.00     2000.00       15.00         .00

 PORE PRESSURE DATA

     PHREATIC SURFACE OPTION

     SECTIONS     -30.00   -15.00      .00    10.00    32.50    60.00
     Y-COORDINATE OF PHREATIC
     SURFACE       15.00    15.00    15.00    15.00    15.00    15.00
```

Fig. No.: B2a

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************
  RESULTS
************


****************************************************
  DEPTH LIMITING TANGENT NO.  1  AT Y =     25.00
****************************************************


 NUMBER  TANGENT  RADIUS   (X) CENTER  (Y) CENTER      F.S.

    1     25.0     30.0        25.0        -5.0       2.123
    2     25.0     30.0        21.0        -5.0       2.463
    3     25.0     34.0        25.0        -9.0       2.214
    4     25.0     30.0        29.0        -5.0       1.981
    5     25.0     26.0        25.0        -1.0       2.086
    6     25.0     34.0        29.0        -9.0       2.017
    7     25.0     30.0        33.0        -5.0       1.977
    8     25.0     26.0        29.0        -1.0       1.982
    9     25.0     30.0        31.0        -5.0       1.965
   10     25.0     32.0        33.0        -7.0       1.971
   11     25.0     30.0        35.0        -5.0       2.029
   12     25.0     28.0        33.0        -3.0       1.994
   13     25.0     30.0        29.0        -5.0       1.981
   14     25.0     32.0        31.0        -7.0       1.969
   15     25.0     28.0        31.0        -3.0       1.968
   16     25.0     32.0        29.0        -7.0       1.993
   17     25.0     32.0        33.0        -7.0       1.971
   18     25.0     28.0        33.0        -3.0       1.994
   19     25.0     28.0        29.0        -3.0       1.979

 F.S. MINIMUM= 1.965 FOR THE CIRCLE OF CENTER (  31.0,  -5.0)

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Fig. No.: B2b

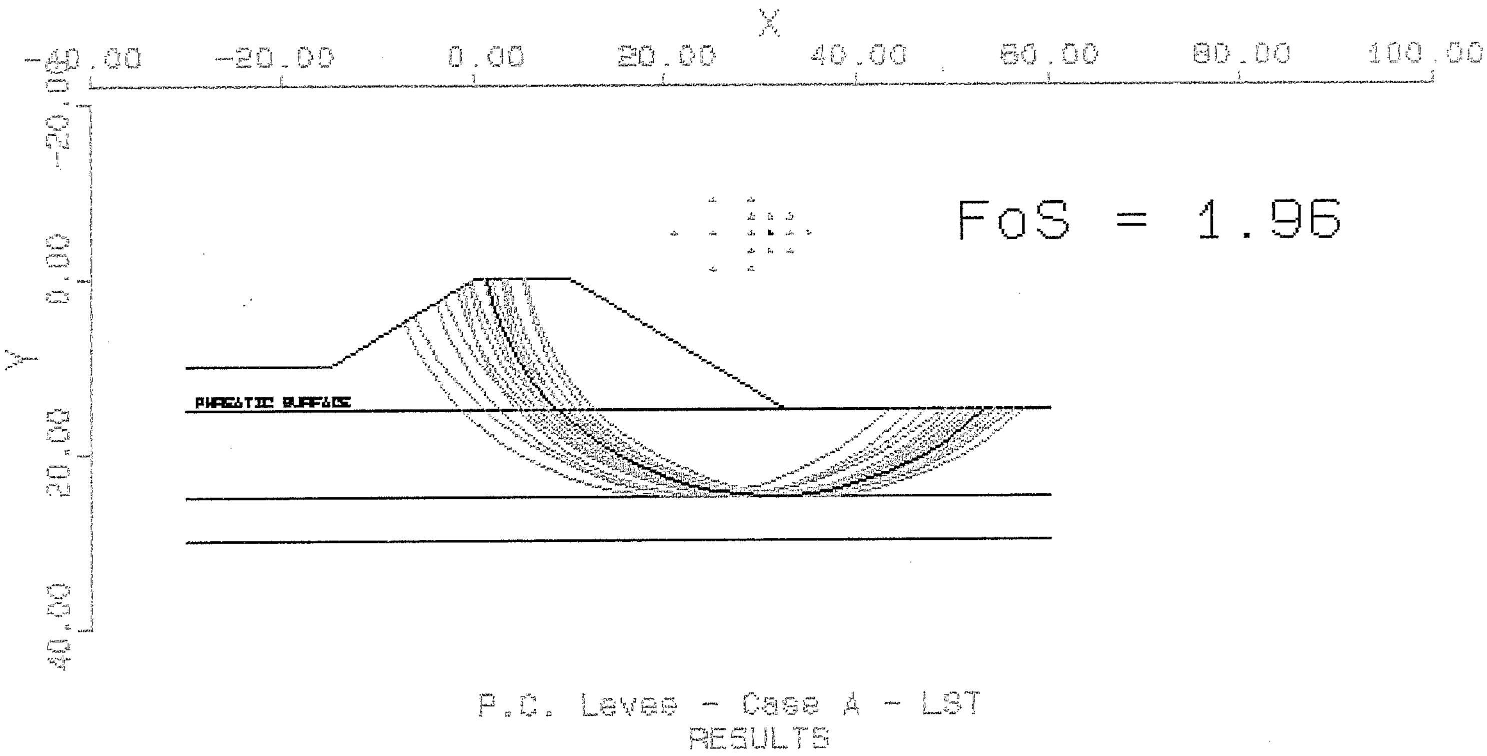
X
-40.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
Y
-20.00
0.00
20.00
40.00
FoS = 1.96
PHREATIC SURFACE
P.C. Levee - Case A - LST
RESULTS

Fig. No.: B2c

RAPID DRAWDOWN (RDD)

```
              ***********************************************
              * ******************************************* *
              * *                                         * *
              * *    --------------------------------     * *
              * *     TSTAB  slope stability analysis     * *
              * *        Revision 2.52 - 01/06/86         * *
              * *    --------------------------------     * *
              * *                                         * *
              * ******************************************* *
              ***********************************************


 **********************************************************************
   P.C. Levee - Case A - RDD
 **********************************************************************


 ******************************************
   ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
 ******************************************


 **************
   INPUT DATA
 **************


  CONTROL DATA,
       AUTOMATIC SEARCH FOR CRITICAL CIRCLE
       NUMBER OF DEPTH LIMITING TANGENTS              1
       NUMBER OF VERTICAL SECTIONS                    6
       NUMBER OF SOIL LAYER BOUNDARIES                4
       NUMBER OF POINTS DEFINING COHESION PROFILE     0
       NUMBER OF CURVES DEFINING COHESION ANISOTROPY  0
       NUMBER OF BOUNDARY LINE LOADS                  0
       NUMBER OF BOUNDARY PRESSURE LOADS              0

       SEISMIC COEFFICIENT                  =        .000
       ATMOSPHERIC PRESSURE                 =        .000
       UNIT WEIGHT OF WATER                 =      62.400
       UNIT WEIGHT OF WATER IN TENSION CRACK =     62.400

  SEARCH STARTS AT CENTER (  25.0,  -5.0),WITH FINAL GRID OF  2.0

  ALL CIRCLES TANGENT TO DEPTH,  25.0,

  GEOMETRY

      SECTIONS     -30.00   -15.00      .00    10.00    32.50    60.00

      T. CRACKS     10.00    10.00      .10      .10    15.00    15.00
      W IN CRACK    10.00    10.00      .10      .10    15.00    15.00
      BOUNDARY 1    10.00    10.00      .10      .10    15.00    15.00
      BOUNDARY 2    15.00    15.00    15.00    15.00    15.00    15.00
      BOUNDARY 3    25.00    25.00    25.00    25.00    25.00    25.00
      BOUNDARY 4    30.00    30.00    30.00    30.00    30.00    30.00

  SOIL PROPERTIES

       LAYER  DENSITY    COHESION  FRICTION ANGLE  DELTA PHI
         1     130.00     680.00        14.00          .00
         2     109.00     900.00          .00          .00
         3     130.00    2000.00        15.00          .00

  PORE PRESSURE DATA

      PHREATIC SURFACE OPTION

      SECTIONS     -30.00   -15.00      .00    10.00    32.50    60.00
      Y-COORDINATE OF PHREATIC
      SURFACE       15.00    15.00    15.00    15.00    15.00    15.00
```

Fig. No.: B3a

```
************
  RESULTS
************


****************************************************
  DEPTH LIMITING TANGENT NO.  1  AT Y =    25.00
****************************************************



 NUMBER  TANGENT  RADIUS   (X) CENTER  (Y) CENTER      F.S.

    1     25.0     30.0        25.0        -5.0       2.722
    2     25.0     30.0        21.0        -5.0       2.788
    3     25.0     34.0        25.0        -9.0       2.786
    4     25.0     30.0        29.0        -5.0       2.911
    5     25.0     26.0        25.0        -1.0       2.743
    6     25.0     30.0        23.0        -5.0       2.724
    7     25.0     32.0        25.0        -7.0       2.745
    8     25.0     30.0        27.0        -5.0       2.781
    9     25.0     28.0        25.0        -3.0       2.719
   10     25.0     28.0        23.0        -3.0       2.698
   11     25.0     28.0        27.0        -3.0       2.810
   12     25.0     26.0        25.0        -1.0       2.743
   13     25.0     28.0        21.0        -3.0       2.742
   14     25.0     30.0        23.0        -5.0       2.724
   15     25.0     26.0        23.0        -1.0       2.694
   16     25.0     26.0        21.0        -1.0       2.718
   17     25.0     26.0        25.0        -1.0       2.743
   18     25.0     24.0        23.0         1.0      CENTER BELOW INTERPOLATED CRACK
   19     25.0     28.0        21.0        -3.0       2.742
   20     25.0     28.0        25.0        -3.0       2.719
   21     25.0     24.0        25.0         1.0      CENTER BELOW INTERPOLATED CRACK
   22     25.0     24.0        21.0         1.0       2.715

 F.S. MINIMUM= 2.694 FOR THE CIRCLE OF CENTER (  23.0,  -1.0)

 Opened plot file: ardd.P01
 Saved plot file:  ardd.P01


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 Execution complete, time =      .11 seconds
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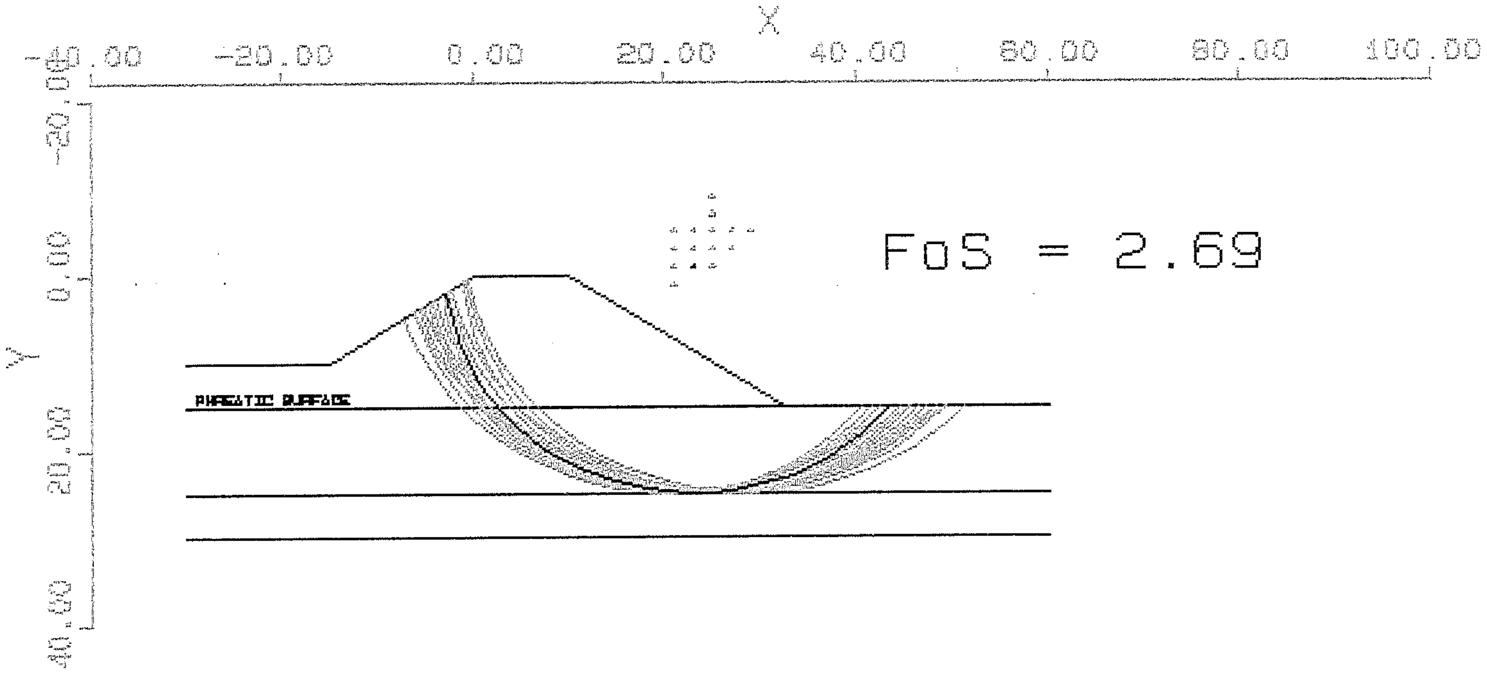
Fig. No.: B3b



P.C. Levee - Case A - RDD
RESULTS

Fig. No.: B3c

PSEUDO-STATIC SEISMIC (PSS)

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               ***********************************************
               * ******************************************* *
               * *                                         * *
               * *    --------------------------------     * *
               * *     TSTAB  slope stability analysis     * *
               * *        Revision 2.52 - 01/06/86         * *
               * *    --------------------------------     * *
               * *                                         * *
               * ******************************************* *
               ***********************************************


  *********************************************************************
    P.C. Levee - Case A - PSS
  *********************************************************************



  ******************************************
    ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
  ******************************************


  **************
    INPUT DATA
  **************


   CONTROL DATA,
        AUTOMATIC SEARCH FOR CRITICAL CIRCLE
        NUMBER OF DEPTH LIMITING TANGENTS               1
        NUMBER OF VERTICAL SECTIONS                     6
        NUMBER OF SOIL LAYER BOUNDARIES                 4
        NUMBER OF POINTS DEFINING COHESION PROFILE      0
        NUMBER OF CURVES DEFINING COHESION ANISOTROPY   0
        NUMBER OF BOUNDARY LINE LOADS                   0
        NUMBER OF BOUNDARY PRESSURE LOADS               0

        SEISMIC COEFFICIENT                   =        .150
        ATMOSPHERIC PRESSURE                  =        .000
        UNIT WEIGHT OF WATER                  =      62.400
        UNIT WEIGHT OF WATER IN TENSION CRACK =      62.400

   SEARCH STARTS AT CENTER (   25.0,   -5.0),WITH FINAL GRID OF   2.0

   ALL CIRCLES TANGENT TO DEPTH,  25.0,

   GEOMETRY

       SECTIONS      -30.00   -15.00      .00     10.00     32.50     60.00

       T. CRACKS      10.00    10.00      .10       .10     15.00     15.00
       W IN CRACK     10.00    10.00      .10       .10     15.00     15.00
       BOUNDARY 1     10.00    10.00      .10       .10     15.00     15.00
       BOUNDARY 2     15.00    15.00    15.00     15.00     15.00     15.00
       BOUNDARY 3     25.00    25.00    25.00     25.00     25.00     25.00
       BOUNDARY 4     30.00    30.00    30.00     30.00     30.00     30.00

   SOIL PROPERTIES

        LAYER   DENSITY     COHESION  FRICTION ANGLE  DELTA PHI
          1      120.00      680.00       14.00           .00
          2      109.00      900.00         .00           .00
          3      130.00     2000.00       15.00           .00

   PORE PRESSURE DATA

       PHREATIC SURFACE OPTION

       SECTIONS      -30.00   -15.00      .00     10.00     32.50     60.00
       Y-COORDINATE OF PHREATIC
       SURFACE        15.00    15.00    15.00     15.00     15.00     15.00
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Fig. No.: B4a

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************
  RESULTS
************



****************************************************
  DEPTH LIMITING TANGENT NO.  1  AT Y =     25.00
****************************************************



 NUMBER  TANGENT  RADIUS   (X) CENTER  (Y) CENTER       F.S.

    1      25.0     30.0       25.0        -5.0        2.148
    2      25.0     30.0       21.0        -5.0        2.135
    3      25.0     34.0       25.0        -9.0        2.126
    4      25.0     30.0       29.0        -5.0        2.311
    5      25.0     26.0       25.0        -1.0        2.231
    6      25.0     34.0       23.0        -9.0        2.120
    7      25.0     36.0       25.0       -11.0        2.127
    8      25.0     34.0       27.0        -9.0        2.159
    9      25.0     32.0       25.0        -7.0        2.131
   10      25.0     34.0       21.0        -9.0        2.146
   11      25.0     36.0       23.0       -11.0        2.130
   12      25.0     32.0       23.0        -7.0        2.117
   13      25.0     32.0       21.0        -7.0        2.136
   14      25.0     32.0       25.0        -7.0        2.131
   15      25.0     30.0       23.0        -5.0        2.124
   16      25.0     34.0       21.0        -9.0        2.146
   17      25.0     34.0       25.0        -9.0        2.126
   18      25.0     30.0       25.0        -5.0        2.148
   19      25.0     30.0       21.0        -5.0        2.135

 F.S. MINIMUM= 2.117 FOR THE CIRCLE OF CENTER (  23.0,   -7.0)

 Opened plot file: apss.P01
 Saved plot file:  apss.P01


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 Execution complete, time =      .11 seconds
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Fig. No.: B4b

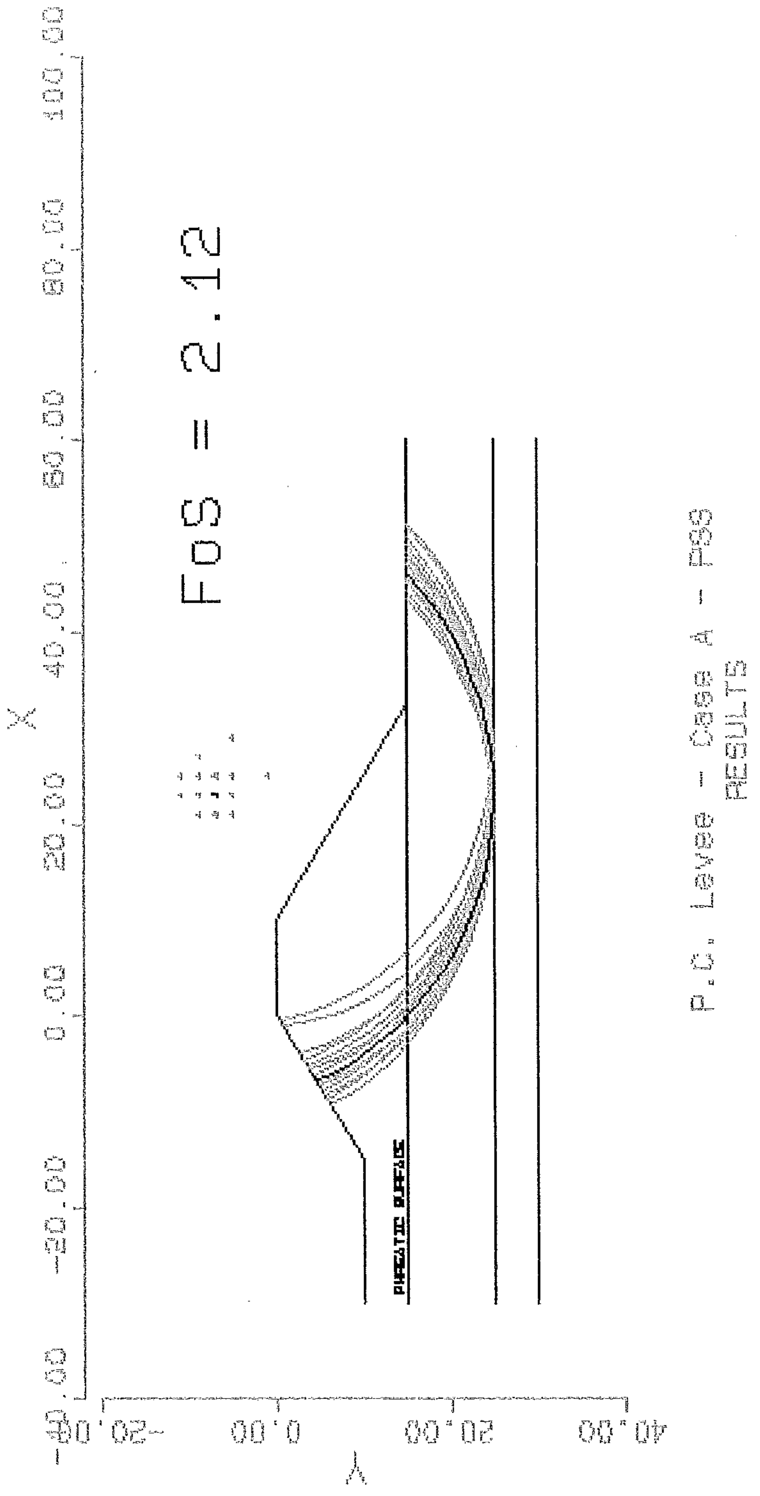
FoS = 2.12
P.C. Levee - Case A - P88
RESULTS
X
Y
PHREATIC SURFACE
-40.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
-20.00
0.00
20.00
40.00

Fig. No.: B4c

HIGH WATER (HWT)

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              ***********************************************
              * ******************************************* *
              * *                                         * *
              * *    -------------------------------      * *
              * *     TSTAB  slope stability analysis     * *
              * *        Revision 2.52 - 01/06/86         * *
              * *    -------------------------------      * *
              * *                                         * *
              * ******************************************* *
              ***********************************************


 *********************************************************************
  P.C. Levee - Case A - HWT
 *********************************************************************


 ******************************************
  ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
 ******************************************


 **************
  INPUT DATA
 **************

  CONTROL DATA,
       AUTOMATIC SEARCH FOR CRITICAL CIRCLE
       NUMBER OF DEPTH LIMITING TANGENTS              1
       NUMBER OF VERTICAL SECTIONS                    6
       NUMBER OF SOIL LAYER BOUNDARIES                4
       NUMBER OF POINTS DEFINING COHESION PROFILE     0
       NUMBER OF CURVES DEFINING COHESION ANISOTROPY  0
       NUMBER OF BOUNDARY LINE LOADS                  0
       NUMBER OF BOUNDARY PRESSURE LOADS              1

       SEISMIC COEFFICIENT                      =        .000
       ATMOSPHERIC PRESSURE                     =        .000
       UNIT WEIGHT OF WATER                     =      62.400
       UNIT WEIGHT OF WATER IN TENSION CRACK =         62.400

  SEARCH STARTS AT CENTER (  15.0,  -5.0),WITH FINAL GRID OF  2.0

  ALL CIRCLES TANGENT TO DEPTH,  25.0,

  GEOMETRY

      SECTIONS      -50.00    -32.50    -10.00       .00     22.50     60.00

      T. CRACKS      15.00     15.00       .10       .10     15.00     15.00
      W IN CRACK     15.00     15.00       .10       .10     15.00     15.00
      BOUNDARY 1     15.00     15.00       .10       .10     15.00     15.00
      BOUNDARY 2     15.00     15.00     15.00     15.00     15.00     15.00
      BOUNDARY 3     25.00     25.00     25.00     25.00     25.00     25.00
      BOUNDARY 4     30.00     30.00     30.00     30.00     30.00     30.00

  SOIL PROPERTIES

       LAYER   DENSITY    COHESION  FRICTION ANGLE  DELTA PHI
         1      120.00     680.00       14.00          .00
         2      109.00     900.00         .00          .00
         3      130.00    2000.00       15.00          .00

  PORE PRESSURE DATA

      PHREATIC SURFACE OPTION

      SECTIONS      -50.00    -32.50    -10.00       .00     22.50     60.00
      Y-COORDINATE OF PHREATIC
      SURFACE        15.00     15.00     15.00     15.00     15.00     15.00

  BOUNDARY FORCES AND PRESSURES

       PRESSURE LOADS
                  POINT A                  POINT B
             X-COORD  PRESSURE        X-COORD  PRESSURE

             -32.50   768.0000        -14.50      .0000
```

Fig. No.: B5a

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***********
  RESULTS
***********


**************************************************
  DEPTH LIMITING TANGENT NO.  1  AT Y =    25.00
**************************************************



 NUMBER  TANGENT  RADIUS   (X) CENTER  (Y) CENTER      F.S.

    1     25.0     30.0        15.0        -5.0       2.942
    2     25.0     30.0        11.0        -5.0       2.989
    3     25.0     34.0        15.0        -9.0       3.001
    4     25.0     30.0        19.0        -5.0       3.146
    5     25.0     26.0        15.0        -1.0       2.967
    6     25.0     30.0        13.0        -5.0       2.941
    7     25.0     32.0        15.0        -7.0       2.966
    8     25.0     30.0        17.0        -5.0       3.006
    9     25.0     28.0        15.0        -3.0       2.940
   10     25.0     28.0        13.0        -3.0       2.917
   11     25.0     28.0        17.0        -3.0       3.038
   12     25.0     26.0        15.0        -1.0       2.967
   13     25.0     28.0        11.0        -3.0       2.958
   14     25.0     30.0        13.0        -5.0       2.941
   15     25.0     26.0        13.0        -1.0       2.914
   16     25.0     26.0        11.0        -1.0       2.940
   17     25.0     26.0        15.0        -1.0       2.967
   18     25.0     24.0        13.0         1.0      CENTER BELOW INTERPOLATED CRACK
   19     25.0     28.0        11.0        -3.0       2.958
   20     25.0     28.0        15.0        -3.0       2.940
   21     25.0     24.0        15.0         1.0      CENTER BELOW INTERPOLATED CRACK
   22     25.0     24.0        11.0         1.0       2.938

 F.S. MINIMUM= 2.914 FOR THE CIRCLE OF CENTER (  13.0,  -1.0)

 Opened plot file: ahwt.P01
 Saved plot file:  ahwt.P01

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 Execution complete, time =      .16 seconds
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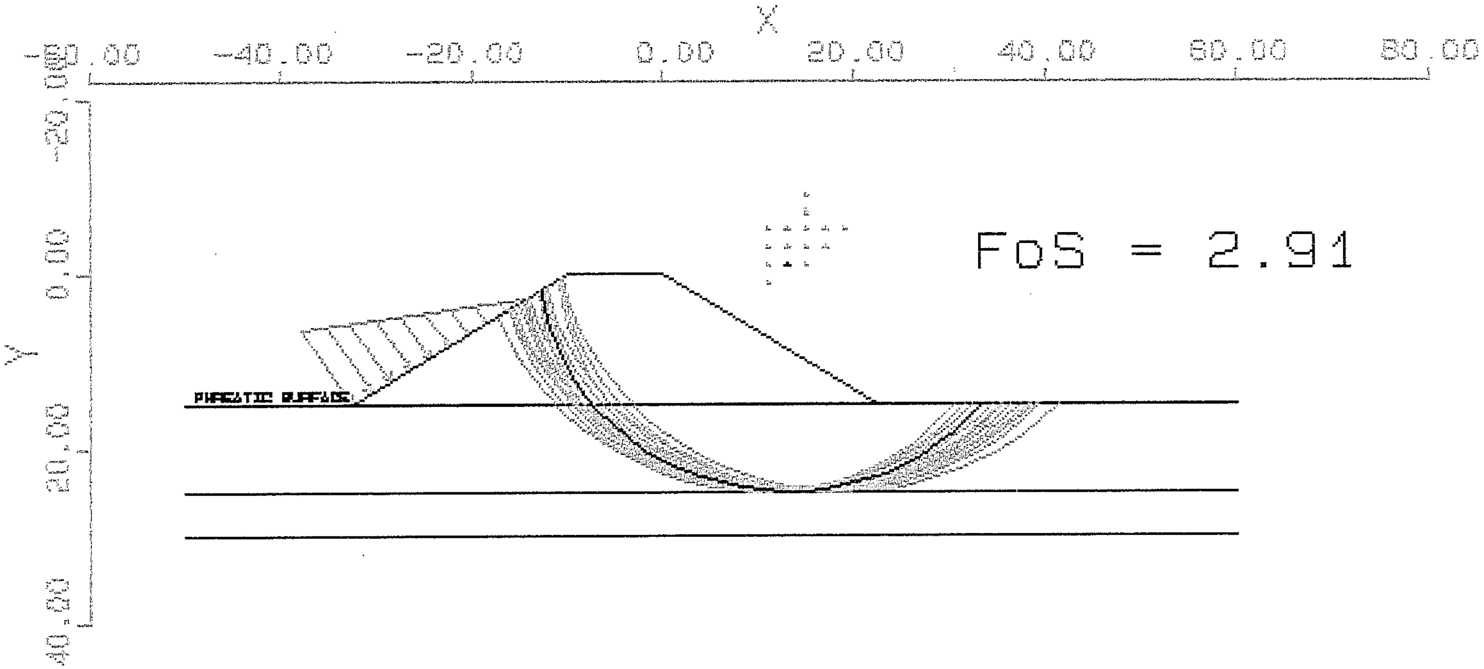
Fig. No.: B5b



P.C. Levee - Case A - HWT
RESULTS

Fig. No.: **B5c**

STEADY STATE SEEPAGE (SSS)

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              ***********************************************
              * ******************************************* *
              * *                                         * *
              * *     --------------------------------    * *
              * *      TSTAB  slope stability analysis    * *
              * *         Revision 2.52 - 01/06/86        * *
              * *     --------------------------------    * *
              * *                                         * *
              * ******************************************* *
              ***********************************************


*********************************************************************
  P.C. Levee - Case A - SSS
*********************************************************************


******************************************
  ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
******************************************


**************
  INPUT DATA
**************

 CONTROL DATA,
      AUTOMATIC SEARCH FOR CRITICAL CIRCLE
      NUMBER OF DEPTH LIMITING TANGENTS                 1
      NUMBER OF VERTICAL SECTIONS                       6
      NUMBER OF SOIL LAYER BOUNDARIES                   4
      NUMBER OF POINTS DEFINING COHESION PROFILE        0
      NUMBER OF CURVES DEFINING COHESION ANISOTROPY     0
      NUMBER OF BOUNDARY LINE LOADS                     0
      NUMBER OF BOUNDARY PRESSURE LOADS                 1

      SEISMIC COEFFICIENT                    =       .000
      ATMOSPHERIC PRESSURE                   =       .000
      UNIT WEIGHT OF WATER                   =     62.400
      UNIT WEIGHT OF WATER IN TENSION CRACK =      62.400

 SEARCH STARTS AT CENTER (  15.0,  -5.0),WITH FINAL GRID OF  2.0

 ALL CIRCLES TANGENT TO DEPTH,  25.0,

 GEOMETRY

     SECTIONS      -50.00   -32.50   -10.00      .00    22.50    60.00

     T. CRACKS      15.00    15.00      .10      .10    15.00    15.00
     W IN CRACK     15.00    15.00      .10      .10    15.00    15.00
     BOUNDARY 1     15.00    15.00      .10      .10    15.00    15.00
     BOUNDARY 2     15.00    15.00    15.00    15.00    15.00    15.00
     BOUNDARY 3     25.00    25.00    25.00    25.00    25.00    25.00
     BOUNDARY 4     30.00    30.00    30.00    30.00    30.00    30.00

 SOIL PROPERTIES

      LAYER   DENSITY    COHESION  FRICTION ANGLE  DELTA PHI
        1      120.00     300.00       27.00          .00
        2      109.00        .00       34.00          .00
        3      130.00    2000.00       15.00          .00

 PORE PRESSURE DATA

     PHREATIC SURFACE OPTION

     SECTIONS      -50.00   -32.50   -10.00      .00    22.50    60.00
     Y-COORDINATE OF PHREATIC
     SURFACE        15.00    15.00    15.00    15.00    15.00    15.00

 BOUNDARY FORCES AND PRESSURES

      PRESSURE LOADS
                 POINT A                  POINT B
             X-COORD  PRESSURE        X-COORD  PRESSURE

             -32.50   768.0000        -14.50      .0000
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Fig. No.: B6a

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************
  RESULTS
************



****************************************************
  DEPTH LIMITING TANGENT NO.  1  AT Y =     25.00
****************************************************



 NUMBER  TANGENT  RADIUS   (X) CENTER  (Y) CENTER      F.S.

    1     25.0     30.0       15.0        -5.0        2.123
    2     25.0     30.0       11.0        -5.0        2.444
    3     25.0     34.0       15.0        -9.0        2.207
    4     25.0     30.0       19.0        -5.0        1.981
    5     25.0     26.0       15.0        -1.0        2.086
    6     25.0     34.0       19.0        -9.0        2.017
    7     25.0     30.0       23.0        -5.0        1.977
    8     25.0     26.0       19.0        -1.0        1.982
    9     25.0     30.0       21.0        -5.0        1.965
   10     25.0     32.0       23.0        -7.0        1.971
   11     25.0     30.0       25.0        -5.0        2.029
   12     25.0     28.0       23.0        -3.0        1.994
   13     25.0     30.0       19.0        -5.0        1.981
   14     25.0     32.0       21.0        -7.0        1.969
   15     25.0     28.0       21.0        -3.0        1.968
   16     25.0     32.0       19.0        -7.0        1.993
   17     25.0     32.0       23.0        -7.0        1.971
   18     25.0     28.0       23.0        -3.0        1.994
   19     25.0     28.0       19.0        -3.0        1.979

 F.S. MINIMUM= 1.965 FOR THE CIRCLE OF CENTER (  21.0,  -5.0)

 Opened plot file: asss.P01
 Saved plot file:  asss.P01


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 Execution complete, time =      .17 seconds
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Fig. No.: B6b

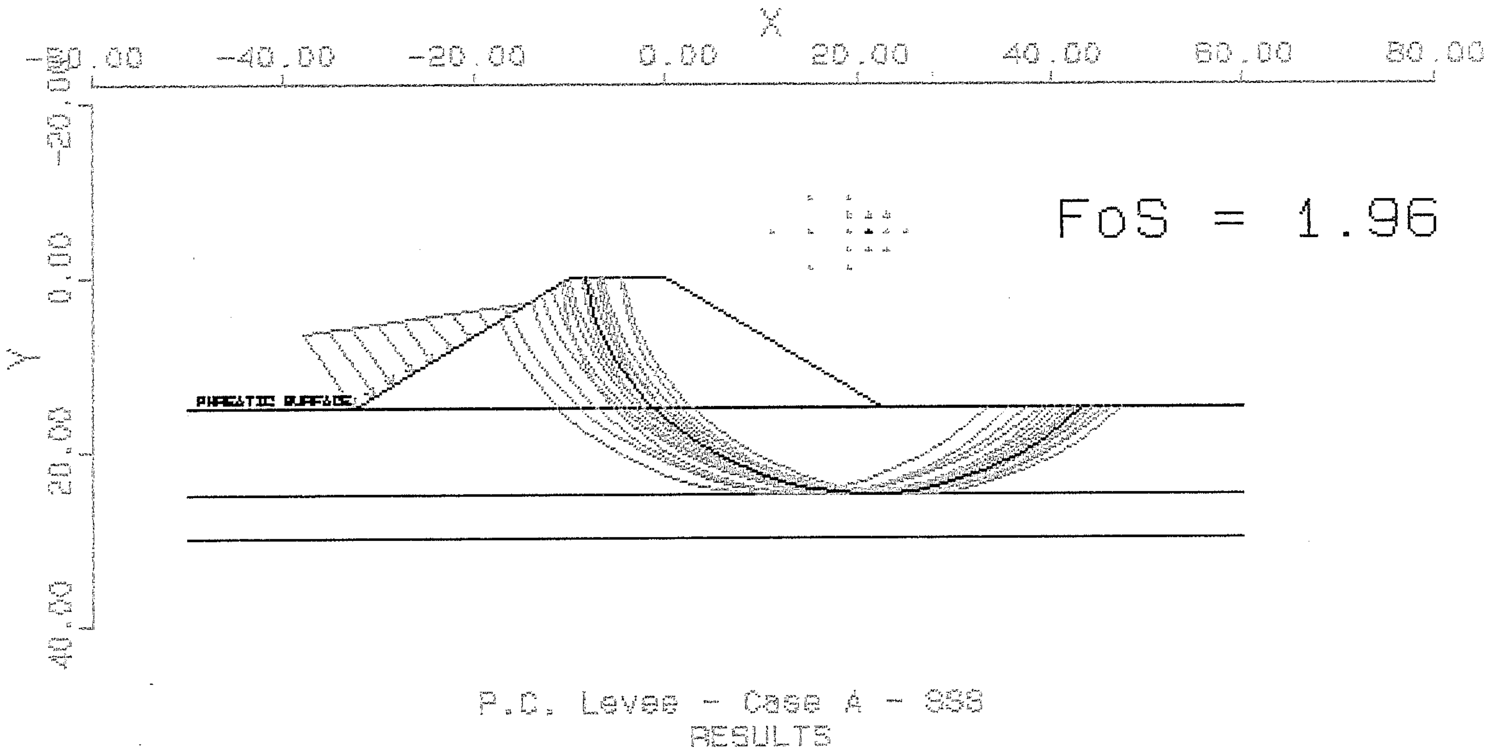
X
-60.00
-40.00
-20.00
0.00
20.00
40.00
60.00
80.00
Y
-20.00
0.00
20.00
40.00
FoS = 1.96
PHREATIC SURFACE
P.C. Levee - Case A - SSS
RESULTS

Fig. No.: B6c